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EXPERIMENT STATION RECORD

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No. 1

With the holding of its forty-first annual convention from November 15-17, 1927, the Association of Land-Grant Colleges and Universities entered upon a new decade of activity under most auspicious circumstances. Presumably the passing of its fortieth birthday was chiefly of significance from a chronological standpoint, yet it seemed to have been accompanied by an appreciable rejuvenescence of the entire organization. The proverbial "new lease of life," as measured by renewed enthusiasm, fresh interests, and a characteristically progressive and forward-looking attitude, was strongly in evidence throughout the meetings.

Although consideration had been given to a number of far western points as a place of assembly, the association met again in Chicago, making this the site of its third successive non-Washington meeting. As usual the accessibility of Chicago was reflected in a large and representative attendance. Delegates were present from every State as well as Hawaii and Porto Rico, and in many cases the delegations included a complete complement of the president, the deans of agriculture and engineering, the directors of research and extension, and the head of home economics activities, as well as other members of the staff. Barely half of the chief executives of the institutions were registered, but there were about 40 extension directors, and the only experiment stations unrepresented were those of Florida, Maryland, Montana, and South Dakota.

The number of auxiliary societies meeting during the convention week was somewhat smaller than usual. The Association for the Advancement of Agricultural Teaching was in session on the preceding day, making possible a joint meeting with the division of resident teaching. The American Association of Soil Survey Workers and the American Society of Agronomy met during the week, the sessions of the latter body overlapping those of the land-grant colleges on the latter's final day. Opportunity was also given for attendance on the meetings of the First National Commercial Forestry Conference. The aggregate attendance of these various groups was considerably in excess of 500, and the contacts formed through the sessions and even more in the numerous group dinners

and other informal gatherings were as usual one of the important benefits of the week.

The greetings of the Secretary of Agriculture were brought to the convention by Dr. A. F. Woods, Director of Scientific Work. Dr. Woods expressed the interest of the Department in the various activities of the association, particularly along research lines, declaring that "as we look into the future of American agriculture we can see an increasing need for fundamental research of the most thoroughgoing type. Much of this will require the cooperation of Department and station workers. While it will in large measure be centered around the solution of problems of direct bearing on agriculture, it will deal with basic aspects rather than direct application."

Dr. Woods also pointed out that with the increasing interest and confidence of the people in publicly supported education and research, there is developing an insistent demand for efficiency, a proper division of work between the State and Federal Government and individuals, effective cooperation, and avoidance of unnecessary duplication of effort. To answer queries along these lines there must be available "rather more detailed information regarding State and Federal projects than we have had in many cases in the past. . . . With the increased demands for accounting it will be necessary for the administrative officers of both the Department and the stations to give much more careful study to the formulation of projects and reports of progress. This will necessarily involve a considerable increase in personnel for that purpose. It will also involve increased work of our joint committee on projects. We hope that everyone will bear the necessity in mind and cooperate with us in meeting these requirements."

In no small degree the success of the 1927 convention was the result of its unusually well constructed program. The central topic selected was The Solution of Present-Day Problems and the Contribution by Land-Grant Institutions. This theme formed the subject of the presidential address, given by President H. A. Morgan of Tennessee, and it was considered in greater detail by others in the general sessions and in the various sections and divisions. Attention was thus focused upon this topic to a degree permitting thorough consideration from many angles.

The general background for the topic was brought out very clearly in the address of President Morgan. He reviewed the history of the land-grant institutions from the days when they were necessarily feeling their way to the present era of proved usefulness and comparative confidence. He advocated a policy of leadership for the land-grant institutions in the realignment of educational forces which he thought to be urgently needed, with a rendering of their utmost

service as fact-finding agencies and also as interpreters and translators of their findings for the benefit of the secondary and elementary schools and the public.

The contributions which the negro land-grant colleges are making were set forth by President John W. Davis of the West Virginia Collegiate Institute. Despite the handicaps under which these institutions have been laboring, President Davis believed that they have already done much to bring about in their respective States an appreciation of the reasonableness of higher education for negroes and an acknowledgement that support of institutions providing it is a legitimate State obligation rather than an object of philanthropy. To the negroes themselves they have demonstrated the value of training along vocational lines as distinguished from the "white collar" professions. In addition they have furnished, in his opinion, a meeting ground tending toward the promotion of better racial understandings.

As regards other specialized aspects of the general subject, the opening paper in the section on engineering dealt with the contributions of the engineering colleges and the section on home economics devoted three of its four half-day sessions to a discussion of the present social, economic, and educational problems of the American family and the contributions of home economics workers along these lines. In the joint sessions of the section on agriculture the best type of education to aid extension and experiment station staffs in the solution of present-day problems was discussed, as was also the development of research in rural sociology with reference to the agricultural situation. In the experiment station division, Director C. G. Williams of Ohio considered the responsibility of the stations and Prof. Eric Englund of the U. S. Department of Agriculture the place of economic research. Similarly the extension section took up from the successive standpoints of marketing, farm management, rural sociology, and the home the agricultural problem itself and the contribution which the extension service can make toward its solution.

Valuable suggestions were presented in all these papers, and the accompanying discussions from the floor served to bring out much additional information. Greatest interest, however, doubtless was evoked by the report of a special committee on the agricultural situation. This committee was authorized in April, 1927, by the executive committee of the association, acting under its interim powers and in recognition of its belief that the existing agricultural situation contained "many serious problems which should be studied with a view of finding incontrovertible facts to be used by the farmers of the country in the solution of these problems," and with the purpose of enabling the association "to make its largest possible contribution."

The committee consisted of nine members headed by Dean and Director T. P. Cooper of Kentucky as chairman and Director F. W. Peck of Minnesota as secretary, the remaining personnel comprising Presidents A. Atkinson of Montana, F. D. Farrell of Kansas, C. A. Lory of Colorado, and H. A. Morgan of Tennessee, Director L. N. Duncan of Alabama, Dean and Director H. W. Mumford of Illinois, and Dr. G. F. Warren of Cornell University. Through the cooperation of the U. S. Department of Agriculture much assistance was also rendered the committee by Mr. H. R. Tolley of the Bureau of Agricultural Economics. Active cooperation was freely given by numerous individuals and by several public and semipublic agencies, and statements were submitted at the special request of the committee by 41 experiment stations.

The report discussed the agricultural status since 1920 with special reference to the problems of agricultural surpluses, land policies in relation to agriculture, taxation, transportation, agricultural credit, immigration, the tariff, agricultural cooperation, individual farm adjustments, research and education, and national agricultural legislation. It found agriculture in most parts of the country still in an unsatisfactory condition, with many changes and adjustments necessary. Its main purpose was to ascertain what these changes and adjustments should be, and on most of the topics it put forward carefully gathered facts, definite views, and concrete recommendations. Much attention was likewise given to the formulation of sound principles.

Following an indorsement of the report by the executive committee it received the close and prolonged consideration of the executive body, particularly with reference to the desirability of a formal expression by the association on such matters. Ultimately a motion was adopted providing that the report "be received and transmitted to the member institutions of the association and others interested for consideration as a contribution toward the development of a national policy for agriculture." The appreciation of the association was extended to the members of the committee, and the executive committee was authorized to print the report "in such numbers as may be necessary."

Another matter of unusual interest was the forthcoming survey of the land-grant institutions by the Federal Bureau of Education. This survey, requested by the association at its 1926 meeting, was provided for by Congress with an appropriation for the current fiscal year of \$67,000 and is expected to occupy about two years. The details of the undertaking were set forth by Dr. Arthur J. Klein, chief of the division of higher education of the bureau, and others. It was

made evident that while the responsibility for the survey would rest definitely with the Bureau of Education it was hoped to carry it on to the fullest extent possible with the active cooperation of the institutions themselves. At the request of the bureau, committees were named by most of the various groups to assist in the undertaking, their personnel being given on page 98. It was also emphasized strongly that what is hoped for is not merely a collection of data for individual institutions but a national study of the accomplishments, the status, and the future objectives of the land-grant type of education which would be, in the words of a resolution of indorsement adopted last April by the executive committee, "both comprehensive and sympathetic with the traditions and objects of such institutions."

Another survey which has been going on for some time in engineering education was described by Dr. William E. Wickenden, director of investigation of the Society for the Promotion of Engineering Education. This survey has been conducted with special reference to the needs of industry, and among Dr. Wickenden's conclusions was his insistence upon a broad and well-rounded training, a marriage as he expressed it, of the cultural and technical. The detailed application of the results of this survey to the land-grant institutions formed the principal theme in the section on engineering, such phases being taken up as the attraction and admission of engineering students, the orientation, guidance, and elimination of these students, and the selection, development, and compensation of engineering teachers.

Earlier in the convention the best type of education in agriculture had been considered. This question was taken up in two papers, one by Director H. C. Ramsower of Ohio as regards prospective extension workers and the other by Dean and Director E. C. Johnson of Washington as to future station workers. Director Ramsower in particular pointed out that the great problems in extension work are those of human relationships, and that while there must be adequate technical training, a broad and basic education without undue specialization and with undergraduate courses in such subjects as psychology, extension methods, English, economics, and history and ultimately with at least a year's graduate work is greatly to be desired. Dean Johnson likewise argued for a broad training for research as "absolutely unquestioned," with sufficient specialization to meet the needs but fundamentally with a background developing resourcefulness and an open mind to cope with the new and ever varying conditions with which the research worker in agriculture is sure to be confronted.

The question of means of improving the quality of college teaching has been a favorite topic in recent conventions, but seldom has it been approached in a more specific way. Two detailed studies were

presented, one an extensive survey by the questionnaire method of the status of attempts at improvement in instruction in the land-grant colleges by Dean C. D. Bohannon of New Mexico, and the other carried on in the U. S. Department of Agriculture and accompanying the report of the committee on instruction in agriculture, home economics, and mechanic arts and entitled *Ways and Means for Measuring College Teaching Efficiency*. The latter report, given in summary form by Dr. A. C. True, pointed out that "scientific procedure for measuring teaching efficiency is a new adventure in the field of education," but that considerable thought is none the less being given to the development of an objective scale and a more scientific method of rating teachers than the prevailing reliance on subjective general impressions. A method worked out by the department of educational psychology of George Washington University and given to 1,113 students in five land-grant institutions at the end of the freshman year to determine the progress actually made under a variety of conditions was described. The test was claimed to be "fair and reasonably accurate" in its findings as to the relative efficiency of teachers, although it was deemed essential that there should be further study and experimentation in the field, with many trials of objective tests and a careful analysis of the results.

The interests of research were prominently though not dominantly before the convention and each of its sections. It is hoped to discuss the principal developments of the meetings in this field in the February issue of the *Record*.

The extension division, as usual, had a full program. Aside from matters already referred to, considerable attention was given the question of supplementary funds, as advocated by the standing committee on extension organization and policy. The recommendations of this committee for increased Federal appropriations were approved by the executive body, and the executive committee was instructed to formulate in conjunction with a special committee and other interested parties a draft of proposed legislation with this end in view.

Notwithstanding the usual informal meeting of the extension division on the day preceding the convention, considerable difficulty was experienced in compressing its business into the allotted time, and a feeling developed that in some way the various divisions of the section on agriculture should have opportunity to discuss their immediate problems at greater length than their single session has permitted. The section on agriculture accordingly voted to ask for a rearrangement of program whereby its divisions of resident teaching, experiment stations, and extension service would be given two half-day sessions each and the section as a whole would hold two sessions instead of three, and this action was approved by the executive com-

mittee. The change will undoubtedly tend to secure the results desired, but it will obviously no longer be possible to devote a full session of the entire section to each of its three interests, and to this extent it will retard their commingling and interchanging of views. There will also be a need for close cooperation between the program committees of the various divisions lest their simultaneous meetings make difficult participation by the numerous individuals performing the dual or even the triple functions of deans and directors of research and extension.

The joint session of the section on agriculture set aside for extension matters was given over to a discussion of the corn-borer problem, largely from the research and extension points of view. The progress which is being made in this country was set forth by Dr. W. H. Larrimer of the U. S. D. A. Bureau of Entomology with special reference to its scientific aspects, while Directors C. F. Curtiss of Iowa and G. I. Christie of Indiana described conditions in Europe as observed by them in a recent visit to the principal infested regions. The active enlistment of a number of the leading entomologists in Europe in studies of this pest was reported by Director Christie as made possible by utilizing private funds aggregating \$100,000 which have been contributed in this country for the purpose. Arrangements have been made to employ on a two-year basis about 35 persons, located in 10 laboratories and 7 European countries, mainly in work with parasites and diseases. The announcement of this undertaking, one of the most pretentious attempts at international cooperation in agricultural science thus far projected, aroused considerable comment, and its development will doubtless be followed with much interest.

Another subject somewhat indirectly related to the work of the association for which room was made on the program was The Relation Between Rural Electricity and Our Colleges and Universities. This topic was presented before one of the general sessions by Dr. E. A. White, director of the national committee on the relation of electricity to agriculture. Dr. White pointed out that the encouraging results that are being secured in obtaining for farmers this much appreciated convenience had been brought about by a thoroughgoing investigation of its possibilities by the colleges prior to attempted development, and maintained that it was a notable example of the benefits which may be secured in rural affairs by the concerted action of educational, commercial, and other related agencies.

The customary report of the bibliographer, Dr. True, was given at the closing general session. This report dealt with the history of the act signed by President Cleveland February 9, 1889, elevating

the Federal Department of Agriculture to cabinet rank. Dr. True brought out the fact that the act of 1862 creating the Department as an independent establishment headed by a commissioner was a compromise unsatisfactory to many of the leading farmers, and that efforts sponsored by their organizations over an extended period were eventually successful despite attempts to substitute a department of agriculture and labor or an even broader department of industries.

At the final session of the executive body the presidency of the association was bestowed upon Dr. J. L. Hills of Vermont, now one of the deans and directors of longest active service and an officer of the association since 1904. Dean Anson Marston of Iowa was made vice president. President R. D. Hetzel of Pennsylvania was re-elected to the executive committee. The offices of secretary and treasurer were recombined with the election of Dean and Director Cooper of Kentucky, but the vacancy arising from his declination had not been filled at the time of writing.

The special committee on the radio problem was made a standing committee of the association. The personnel of this committee and a list of new committee appointments are given on page 100 of this issue.

The convention closed with many expressions of commendation from those in attendance, and it seems probable that it is destined to rank as one of the most successful gatherings in recent years. Outwardly there was little alteration as to leadership or personnel or procedure, but internally a renewal of enthusiasm, a well-sustained interest throughout the sessions, and a mental reinvigoration was as evident as it was encouraging. The association as usual revealed itself as forward looking, but it was also notably forward moving. To its well recognized feeling of responsibility under such conditions as have lately prevailed in agriculture there seemed to have been added a greater insistence upon active leadership and an enlarging interest in specific measures likely to prove beneficial. There was little indication of an attitude of complacent acquiescence in following along stereotyped lines or of an accumulated inertia such as sometimes besets organizations with advancing years. This is well, for the association is the official representative of a group of institutions dealing primarily with living men and living issues, and its face must be turned resolutely to the future if it would adequately serve their cause. With such a spirit as characterized the 1927 convention, there need be few misgivings.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Applied colloid chemistry: General theory, W. D. BANCROFT (*New York and London: McGraw-Hill Book Co., 1926, 2 ed., rev. and enl., pp. IX+489, figs. 13*).—This book has been practically rewritten since the first edition, aside from the general arrangement, to bring it up to date with the advances of the last five years, improvement in our understanding of gelatinous precipitates and jellies being particularly noted in the preface. The contents comprise an introduction and chapters on adsorption of gas or vapor by solid, chemical reactions, adsorption of vapor by liquid and of liquid and solid by solid and liquid, adsorption from solution, surface tension, Brownian movements, coalescence, preparation of colloidal solutions, properties of colloidal solutions, electrical properties of colloidal solutions, stability of colloidal solutions, gelatinous precipitates and jellies, emulsions and foams, nonaqueous colloidal solutions, fog, smoke, gases and solids in solids, and thickness of surface films. References are abundant throughout, and specific instances of practical application, together with experimental findings, are freely used in exemplifying the theoretical aspects of colloid chemistry discussed.

Textbook of agricultural chemistry.—I, Plant nutrition, E. BLANCK (*Lehrbuch der Agrikulturchemie. 1. Teil, Pflanzenernährungslehre. Berlin: Borntraeger Bros., 1927, pp. VII+207, fig. 1*).—This part of a comprehensive treatise on agricultural chemistry, dealing with plant nutrition, is in two main sections, one on the chemical constitution of organic plant substances and ash constituents, the other on the formation and transformation of organic substances in the plants.

The isolation of some hitherto undescribed products of hydrolysis of proteins, II, III, S. B. SCHRYVER and H. W. BUSTON (*Roy. Soc. [London] Proc., Ser. B, 99 (1926), No. B 699, pp. 476-487; 100 (1926), No. B 703, pp. 360-367*).—Continuing an investigation of the "carbamate process" previously noted (E. S. R., 46, p. 802) for the separation of the amino acid content of protein hydrolyzates, the authors find it possible to fractionate the hydrolytic products into the three main groups of (1) the amino acids yielding barium salts insoluble in 70 per cent alcohol, consisting entirely of dicarboxylic amino acids; (2) amino acids yielding barium carbamates insoluble in ice-cold water; and (3) amino acids yielding barium carbamates soluble in ice-cold water. The oat glutelin, the hydrolysis of which forms the main subject of part 2, was prepared by a new method consisting essentially in stirring 300 gm. of the oat flour into 2 liters of 0.4 per cent caustic soda, gelatinizing the starch by allowing the mixture to stand for 2 hours, bringing the reaction back to pH 7 by means of hydrochloric acid, and dissolving the starch with taka-diastase. Any separated protein was redissolved after the starch hydrolysis by adding a little caustic soda, subsequent to which the liquid was filtered out through muslin and cleared in a Sharples centrifuge to yield an opalescent filtrate from which the protein was obtained as a copious white precipitate on adding hydrochloric acid.

Among the compounds isolated were (1) a base, hydroxylysine, first isolated by the authors in conjunction with Mukherjee (*E. S. R.*, 54, p. 408), found in the barium carbamates insoluble in ice water, (2) an amino acid of a formula corresponding with hydroxyaminobutyric acid which yielded a dibenzoyl compound melting at 112° C. and a phenylisocyanate derivative melting at 143°, and (3) an amino acid of a formula agreeing with hydroxyvaline, the dibenzoyl compound from which melted at 117°, while its phenylisocyanate compound melted at 145°.

In part 3 the isolation from the hydrolysis products of a glutelin from oats and from a castor bean protein of an amino acid hitherto undiscovered is described, the new compound having the empirical formula $C_8H_{10}O_3N$. Beyond the fact that the molecule contains one amino group, one carboxyl group, and one hydroxyl group, its constitution has not been worked out. The two non-amino nitrogen atoms appeared to be in the form of some basic group, it being suggested from the analogy of histidine that this grouping may be a ring similar to the iminazole ring. The base, which has been designated "protocline" to indicate a base derived from proteins and containing 8 carbon atoms in its molecule, was found to have an acid dissociation constant of 1.8×10^{-10} , the basic dissociation constants not being determinable from the curve given by an electrometric titration. The base and most of its salts were found extremely soluble in water, the dibenzoyl derivative melting at 109°, the phenylisocyanate derivative at 130°, and the phenyl hydantoin at 148°. The base was distinguishable from histidine by means of various color reactions. The oat glutelin used in this investigation was prepared as noted in part 2.

Sulfur in proteins.—III, Derivatives of *l*- and *t*-cystine, R. A. GORTNER and W. F. HOFFMAN (*Jour. Biol. Chem.*, 72 (1927), No. 1, pp. 433-448).—Continuing the work previously noted (*E. S. R.*, 54, p. 501), this study contributed by the Minnesota Experiment Station describes the method of preparation and the properties of *l*-cystine and of *t*-cystine (the latter prepared from *l*-cystine by boiling with 20 per cent hydrochloric acid). A considerable number of derivatives of both forms of this amino acid were prepared. These included the dihydrochlorides, cysteic acids, phenacyl esters, tetracarbethoxy cystines, dibenzoyl cystines, the diethyl ester dihydrochlorides of both isomers, the di- β -naphthalenesulfonocystines, the phenylisocyanates of both forms, the phenylhydantoins, the cysteines, and the benzyl cysteines. The two forms of cystine always form derivatives of the same empirical formula, but the derivatives were in no instance found to be alike in melting point, and in only a few instances were they identical in crystal form. Optically active components could not be obtained from the *t*-cystine, from which fact the conclusion is drawn that the *t*-cystine is more probably an internally compensated form than racemic cystine.

It is considered that the experiments here recorded throw no light on the change which takes place when cystine is boiled with a strong acid, but that they do indicate the change to be profound.

The catalytic formation of mixed cholesteryl ethers, C. E. BILLS and F. G. McDONALD (*Jour. Biol. Chem.*, 72 (1927), No. 1, pp. 1-11).—Floridin previously activated by heating for 2 hours at 300° C. exerts a dehydrating action upon cholesterol, producing dicholesteryl ether. This action was shown not only by floridin but also by many other fuller's earths of widely different catalytic activity, and by kieselguhr, kaolin, bentonite, bauxite, and to a slight extent talc. No catalytic action was found in the cases of pumice, silica gel, natural amorphous silica, permutit, powdered glass, bone black, or vegetable charcoal.

The action here shown to be a dehydration, with the formation of dicholesteryl ether, was formerly considered (E. S. R., 55, p. 711) to be a polymerizing action. The catalyzed dehydration of cholesterol did not take place in solutions in the lower alcohols, but in the higher alcohols, from isoamyl to secondary octyl alcohol, mixed cholesteryl ethers were formed. These mixed ethers were better prepared, however, by dissolving the alcohol or phenol in question, together with the cholesterol, in benzene, toluene, or xylene. Dicholesteryl ether was obtained by the action of floridin upon cholesteryl acetate. Various physical and chemical constants were determined for the synthesized *d*-bornyl-, phenyl-, allyl-, secondary octyl-, *n*-heptyl, *n*-hexyl, isoamyl-, isobutyl-, *n*-butyl-, isopropyl-, *n*-propyl-, ethyl-, and methyl-, mixed ethers of cholesteryl.

On the oxidation of glucose in alkaline solutions of iodine, W. F. GOEBEL (*Jour. Biol. Chem.*, 72 (1927), No. 2, pp. 801-807).—This is a study of the hypiodite oxidation method for the determination of formaldehyde (E. S. R., 9, p. 420) and of aldose sugars,¹ proposed by G. Romijn and, with respect to glucose, modified by Willstätter and Schudel (E. S. R., 40, p. 312), the latter authors finding it necessary to add the alkali (sodium hydroxide in the case of Willstätter and Schudel's form of the method) slowly to the sugar iodine solution to insure quantitative oxidation to the corresponding aldonic acid.

In the first series of experiments recorded in the present paper the effect of the rate of addition of two equivalents of normal sodium hydroxide upon the oxidation of 10 cc. of 0.9 per cent glucose by 20 cc. of *N*/10 iodine in potassium iodide solution at room temperature was determined, with the result that an exactly 100 per cent oxidation to gluconic acid was obtained when the alkali was added during from 2 to 4 minutes, but when the alkali was added during from 3 to 60 seconds the theoretical reaction was but from 96.5 to 99.4 per cent completed.

The second series of experiments, made with iodine and alkali solutions of the same concentration as those used in the Willstätter and Schudel method, but mixed in the absence of any organic reductant, showed that when the organic reductant was not present the rate at which the alkali was added to the iodine solution had no influence upon the rate at which the hypiodite changed to iodate, while the third series in which both glucose oxidation and iodite formation were simultaneously studied showed that the rate of addition of the alkali had a marked effect on the formation of iodate in the presence of the sugar reductant.

It is concluded that the failure to obtain complete reaction when the alkali is added too fast is probably due to the conversion of the hypiodite to iodate, which latter does not oxidize glucose, before the sugar oxidation has had time to complete itself. The possibility of the enolization of the glucose with the formation of compounds not readily oxidized by hypiodite is also recognized, however.

The preparation of hexonic and bionic acids by oxidation of aldoses with barium hypiodite, W. F. GOEBEL (*Jour. Biol. Chem.*, 72 (1927), No. 2, pp. 809-814).—The hypiodite oxidation of aldoses, discussed as a quantitative method in the preceding paper, is here applied to the preparation of the sugar acids. Barium hydroxide has been substituted for sodium hydroxide because of the ease with which the metal is removed from the reaction products. The method is found to have the advantages of speed, ease of manipulation, and good yield.

An inexpensive and accurate gas chain for liquids lighter than saturated potassium chloride solution, H. C. WATERMAN (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 3, pp. 390-395, figs. 2).—A hydrogen electrode apparatus designed

¹ *Ztschr. Analyt. Chem.*, 86 (1897), No. 6, pp. 349-359.

to be made cheaply, and practically without glass blowing, in the laboratory is described and figured. The advantages claimed are simplicity and low cost without sacrifice of such accuracy features as the sharp liquid junction, etc. A special form of the electrode vessel, consisting essentially of a Squibb funnel, adapts the apparatus for the handling of foaming liquids; and in either form it may be used either as a bubbling hydrogen, or as a quinhydrone system. Repeated tests with N/20 potassium hydrogen phthalate showed departure from the theoretical value of 0.005 pH or less.

On the separation of histidine and arginine.—II, The separation of the silver compounds at pH 7.0, H. B. VICKERY and C. S. LEAVENWORTH (*Jour. Biol. Chem.*, 72 (1927), No. 1, pp. 403-413).—Reporting a reexamination of the precipitation of histidine and arginine by silver salts in alkaline solution, as proposed by A. Kossel and F. Kutscher³ and modified by A. Kossel and S. Edlbacher,⁴ this contribution from the Connecticut State Experiment Station continues earlier work (E. S. R., 55, p. 714), and shows that if a solution of these two bases containing an excess of soluble silver salt is brought to pH 7, the histidine is completely separated from the arginine after a second precipitation of the silver compound. If the mixture be brought to a reaction slightly alkaline to phenolphthalein, as recommended by Kossel and Edlbacher, all of the histidine and most of the arginine are precipitated. After the removal of the histidine at pH 7, it was found possible to precipitate the arginine silver compound at a reaction strongly alkaline to phenolphthalein or at about pH 10 to pH 11. Saturation of the solution with barium hydroxide to precipitate the arginine was found both unnecessary and undesirable. The silver salts were conveniently decomposed with hydrochloric acid, and the bases were satisfactorily recovered as dinitronaphtholsulfonates.

The colorimetric estimation of cystine and glutathione, G. HUNTER and B. A. EAGLES (*Jour. Biol. Chem.*, 72 (1927), No. 1, pp. 177-183).—This is a modification of the method of Folin and Looney (E. S. R., 47, p. 504), the change consisting essentially in the substitution of normal sodium hydroxide for the sodium carbonate of the original method. It is also recommended that the test solution be neutralized before adding the (2 cc.) sodium hydroxide, so that the reduction of the reagent may take place in all cases in approximately the same concentration of alkali, and because the sodium hydroxide addition is but slightly more than enough to prevent the development of a blue color in the blank on a neutral solution.

The estimation of milk fat in milk chocolate by means of a modified xylene number, C. A. GREENLEAF (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 3, pp. 396-404, fig. 1).—A modification of the method of Bertram, Bos, and Verhagen⁴ for the determination of butterfat in fat mixtures is described, and a more accurate procedure for the calculation of the results is given, as follows:

"Reagents.—(a) Glycerin—potassium hydroxide mixture.—To 300 cc. of C. P. glycerin, added 80 cc. of potassium hydroxide solution containing 750 gm. per liter. (b) Magnesium sulfate solution.—150 gm. per liter. (c) Dilute sulfuric acid.—17 cc. of concentrated sulfuric acid diluted to 500 cc.

"Procedure.—Into a tared 500-cc. Erlenmeyer flask weigh exactly 10 gm. of the fat. Conduct also a blank determination without fat. Add 20 cc. of glycerin-potassium-hydroxide mixture and saponify gently over a small flame until the solution is perfectly clear, avoiding overheating. Add 175 cc. of hot, recently boiled distilled water, place in a water bath, and bring the temper-

³ Hoppe-Seyler's Ztschr. Physiol. Chem., 31 (1900), No. 1-2, pp. 185-214.

⁴ Hoppe-Seyler's Ztschr. Physiol. Chem., 110 (1920), No. 5-8, pp. 241-244.

⁵ Ztschr. Deut. Öl- u. Fett-Indus., 44 (1924), No. 36, pp. 445-449.

ature to 80° C. Add gradually 51 cc. of the hot magnesium sulfate solution, measured at 80°, whirling the contents of the flask. Return to the bath and hold at 80° for 5 minutes with frequent shaking. Cool with shaking to 20°, bring the contents of the flask to 260 gm. with distilled water at 20°, stopper, and shake vigorously. Place in a water bath at 20° for 5 minutes.

"Filter at once on a Büchner funnel, using suction, pressing down the cake of magnesium soaps and draining thoroughly, in order to secure the necessary volume of filtrate. Transfer 200 cc. of the filtrate to a separatory funnel, pipette in 50 cc. of the dilute sulfuric acid, add 50 cc. of xylene, and shake thoroughly at intervals for 5 minutes.

"Allow the layers to separate and draw off the aqueous layer through a folded filter. Transfer 200 cc. of this solution to a 500-cc. Florence flask, add 50 cc. of water and a few pieces of pumice, and distill exactly 200 cc. in about 40 minutes, using the Polenske apparatus. Titrate the distillate with N/20 alkali, using phenolphthalein. Subtract the blank and divide the remainder by 2 to obtain the 'xylene number.' . . .

"While the values do not yield a single linear equation, the entire series can be approximated by two straight lines, one for values from 0 per cent to 40 per cent, the other from 40 per cent to 100 per cent butterfat, derived by the ordinary two-point formula $\frac{P-P_1}{P_2-P_1} = \frac{N-N_1}{N_2-N_1}$, where P=percentage of butterfat, and N=xylene number. From this relation, the line for values up to 40 per cent is $\frac{P}{40} = \frac{N-0.40}{11.22-0.40}$, or $P = \frac{N-0.40}{0.2705}$, if N is less than 11.22 (1). From 40 per cent to 100 per cent $\frac{P-40}{100-40} = \frac{N-11.22}{25.9-11.22}$, or $P = \frac{N-1.43}{0.2447}$, if N is greater than 11.22 (2)."

Twelve samples of butterfat examined by this procedure gave values from 25.20 to 27.50, averaging 26.18, and six samples of cacao butter gave values from 0.10 to 0.40, with an average of 0.19.

Using these average values, the percentage of butterfat in a mixture of butterfat and cacao butter may be estimated by the equation: Percentage of butterfat = $\frac{\text{Xylene No.} - 0.19}{0.288}$, if the xylene number is less than 11.72, or percentage of butterfat = $\frac{\text{Xylene No.} - 2.08}{0.241}$, if the xylene number is greater than 11.72.

A modified electro-Gutzeit apparatus for the quantitative estimation of minute amounts of arsenic in insect tissue. D. E. FINK (*Jour. Biol. Chem.*, 72 (1927), No. 2, pp. 737-743, fig 1).—The apparatus described was designed to avoid irregular results obtained with an apparatus similar to that of W. E. Lawson and W. O. Scott,⁵ the modified design being said to resemble that described by C. Mai and H. Hurt.⁶ It consists essentially of a U tube, 11 cm. high, 1 cm. in inside diameter, and having a capacity of 15 cc. Into this tube are fitted hollow, ground glass stoppers carrying platinum wires to which are attached a cathode consisting of a strip of pure sheet lead 2.5 by 6.25 cm. and an anode consisting of a strip of platinum foil of the same dimensions, together with a side tube attached to the cathode side of the U and shaped suitably for containing the mercuric bromide papers used in the test. Consistent results were obtained with the apparatus, and it was found sensitive to 0.00002 mg. of arsenious acid and to 0.001 mg. of arsenic acid. Notes on the selection of paper strips for preparing the mercuric bromide paper are included in the report.

⁵ *Jour. Biol. Chem.*, 64 (1925), No. 1, pp. 23-28.

⁶ *Ztschr. Untersuch. Nahr. u. Genussmittel*, 9 (1905), No. 4, pp. 193-199.

METEOROLOGY

The relations of soil and air temperatures in their influence on crop returns [trans. title], H. KASERER (*Fortschr. Landw.*, 2 (1927), No. 7, pp. 205-212, figs. 3; abs. in *Internat. Rev. Agr.* [Rome], n. ser., 18 (1927), No. 5, pp. 554, 555 (258T, 259T).—The author concludes, as a result of a study of the prevailing conditions, that the poor crop of grain in the Danube districts in 1924 was due in part to the lag of soil temperature behind air temperature in the early part of the season, resulting in insufficient soil nutrition (supply of nitrogen, phosphoric acid, potash, and water) to enable the plant to profit to advantage by air nutrition (supply of carbon dioxide and light) later in the season. He states that flowers and fruit can develop properly only when air nutrition, particularly assimilation of carbon dioxide, does not have to wait on the soil nutrition factors. It is especially important that the plant shall have a sufficient supply of carbon dioxide at the time of flower development and fruit formation. The carbon dioxide of the air is not sufficient for the plant needs and the soil has to make good the deficiency, and carbon dioxide production is dependent to a high degree upon temperature of the soil. It is suggested that the relation of the temperature of the soil to that of the air in spring may play an important part in crop forecasting.

Some correlations between rainfall and production in Australia, H. BARKLEY (*Nature* [London], 120 (1927), No. 3016, p. 270).—From observations extending over a period of years, the author traces certain correlations between rainfall and wheat yields, grazing capacity of ranges, fleece weight, and lamb production. It is stated that he finds an 80 per cent correlation between August-September rainfall and the final yield of wheat, and that crop estimates for the season of 1926-27, based on such correlations, were within 10 per cent of the yield finally reported. Rains in October and November were found to have some influence on yield, but chiefly by increasing the size and water content of the grain. Fleece weight appeared to be correlated with January and February rainfall, and lamb production with that of January and April.

Influence of climatic conditions on the yield of wool [trans. title], G. HOXMARK (*Min. Agr.* [Argentina], Secc. Propaganda e Informes [Circ.] 716 (1927), pp. 25, figs. 12).—On the basis of data for the different provinces of Argentina with regard to temperature, precipitation, and wool production, the author concludes that low temperatures and high precipitation increases the production of wool.

The Nile flood and the following winter in central Europe [trans. title], F. GROSSMAYR (*Met. Ztschr.* [Brunswick], 44 (1927), No. 8, pp. 292-296).—Certain conditions are indicated which it is thought may be useful in predicting the winter temperature of central Europe. The relation of the Nile flood to pressure and temperature conditions in Argentina, Greenland, Labrador, the Azores, and other parts of the world is also discussed.

Meteorological summaries for the year 1926 (*Kentucky Sta. Rpt.* 1926, pt. 1, pp. 34-36).—Data compiled from records of the United States Weather Bureau Station at Lexington, Ky., on temperature, precipitation, wind, and cloudiness are summarized in tables. The records for temperature and precipitation cover the period 1872-1926.

Meteorological observations (*Rothamsted Expt. Sta., Harpenden, Rpt.* 1925-1926, pp. 52, 53, figs. 2).—The deviation of sunshine, mean air temperature, and rainfall from their average monthly values is shown for the seasons 1924-25 and 1925-26 at Rothamsted.

SOILS—FERTILIZERS

Soil and civilization, M. WHITNEY (*New York: D. Van Nostrand Co., 1925, pp. X+278, pls. 5, figs. 32*).—The subject of man in his relation to the soil is presented from four distinct viewpoints, though the first, that of the modern concept of the soil (chapter 1), in which the soil is shown as a living, complex, but ever-changing thing, pervades the entire book. The second viewpoint, that of the origins, properties, and management of the soils, appears in chapters 2, 3, and 4, dealing, respectively, with the important soils of the United States, methods of soil control, and the rôle of fertilizers. The third, the historical viewpoint, occupies chapters 5, 6, and 7, taking up the development of man on the earth and the beginnings of organized agriculture, agriculture in the older countries of the world, and the renaissance of agriculture. The final aspect presented, the possibilities involved in the further interinfluence between man and the soils, is briefly considered in chapter 8, entitled *What of the future?*

A study of the soils of Hidalgo County, Texas, and the stages of their soil lime accumulation, H. W. HAWKER (*Soil Sci., 23 (1927), No. 6, pp. 475-485, pl. 1, fig. 1*).—This report from the Texas Experiment Station is essentially a study of the various stages of leaching found in the Hidalgo County soils, but also notes the principal characteristics of each of the nine soil series of the county and includes a map indicating their distribution.

The youngest soils, first bottom Rio Grande and Harlingen, show no evidence of leaching or soil lime accumulation in any particular horizon within the section. A second stage, represented by the Laredo soils, shows a fairly uniform reaction with hydrochloric acid throughout the section, small lime concretions and accretions, and some similar indications, 3 ft. below the surface. The third stage of leaching is found in the terrace Victoria and Hidalgo soils, which effervesce from the surface downward, the effervescence increasing with depth. Small, soft lime accretions or concretions are found in the soil mass at from 12 to 18 in., and continue to a depth of more than 10 ft. The fourth stage is found in the southern part of the area of Brennan and Willacy soils, where the carbonates have been completely leached from the first 30 to 36 in. of the soil, below which is found a yellowish-brown to buff-brown or pinkish-buff layer, highly calcareous and containing much soft white lime in large and small accretions and concretions. Duval and Nueces soils represent the fifth or maximum degree of leaching, no effervescence occurring above the caliche, which is found at depths of from 3 to 8 ft. and is quite hard in the surface at the shallower depths.

Better way of soil sampling (*U. S. Dept. Agr., Off. Rec., 6 (1927), No. 38, p. 3*).—Brief reference is made to a method, attributed to S. Pinkert, for the permanent mounting of relatively thin, light sections of soil profile columns, previously noted (*E. S. R., 57, p. 104*), the process being described as follows:

"The new method . . . consists of collecting a large column of soil and treating it with gelatin so that the particles and layers remain together, and with glycerin to preserve the color. From this column a thin slice of the soil is cut off and a narrow molding built around the edge to hold the soil layer in place. Even in a vertical position, soil treated in this way will not fall apart. To complete the exhibit of a certain kind of soil, a similar panel is fastened on at the upper end of the soil column, and a sample of the kind of vegetation occurring on that kind of soil is applied on the panel. A soil sample of this kind is less than 0.5 in. thick. Its color is retained, though its texture is not so clearly evident. The method is exceedingly practicable and the samples easily transported."

The seedling plant method of determining soil nutrient deficiency, J. W. AMES and R. W. GERDEL (*Soil Sci.*, 23 (1927), No. 6, pp. 455-466, fig. 1).—A critical study of the Neubauer seedling method (*E. S. R.*, 53, p. 319) is reported from the Ohio Experiment Station.

It was found that the analysis of the roots was troublesome because of the difficulty both in removing all soil particles and in securing the entire root system, and unnecessary because analyses of the tops in every case paralleled those of the whole plant. The potash absorbed in the pot experiments practically always varied directly with that in the field tests, but was much less in the pot than in the field. Phosphorus assimilation, however, was found always greater in the pot than in the field test, and, as it showed much less variation in the pot than in the field, the seedling method, at least where dependent upon the use of wheat seedlings, was judged useless with respect to phosphorus. Subsequent experiments furnished the same indications with respect to corn, soy bean, and buckwheat seedlings. It was concluded that there is not at present known any one plant which will indicate nutrient availability for all kinds of crop plants.

The discrepancy between duplicate pots was often of the same magnitude as the difference between the various soils investigated. Potassium absorption variations were neither large enough nor constant enough to indicate the potassium requirements of the soils studied. Phosphorus assimilation was not found to vary as indicated by Neubauer. While it is considered possible that the seedling method may be so standardized as to serve as an availability index, the suggestion is also put forward that insurmountable physiological limitations may be found to exist.

The assimilation of phosphorus from phytin by red clover, A. F. HECK and A. L. WHITING (*Soil Sci.*, 24 (1927), No. 1, pp. 17-29, pls. 2).—Using methods similar to those employed in their study of the utilization of the phosphorus phytin by oats (*E. S. R.*, 56, p. 624), the authors of this contribution from the University of Illinois find that while the clover did not absorb as much phosphorus from phytin as did the oats of the previous experiments, absorption was nevertheless markedly greater than from rock phosphate or from tricalcium phosphate. The clover hay had a phosphorus content two or three times that said to be commonly found, some of the cuttings showing from 10.4 to 17.9 lbs. per ton. Organic phosphorus was found in the rock phosphate used, and was considered responsible for increased growth found in the red clover crop treated with this fertilizer. Phosphorus in the roots of the oats appeared an important source of phosphorus for the succeeding crop. Liming experiments led to the conclusion that lime can bring about a reversion of the available organic phosphorus to a less available inorganic form, this latter effect appearing to take place even with the organic phosphorus found in the rock phosphate.

A study of the colloidal fraction of certain soils having restricted drainage, W. L. POWERS (*Soil Sci.*, 23 (1927), No. 6, pp. 487-491, figs. 2).—In this percolation study from the Oregon Experiment Station, the increase in rate of percolation through Dayton silty clay loam soil and a heavy alkaline loam from the Vale experiment field indicated that all treatments were better than no treatment at all, but that the greatest success was obtained with treatments of lime and manure, sulfur and manure, green manuring, and the use of alum and a saturated solution of calcium sulfate. Qualitative flocculation studies on the colloids of these soils gave the usual indications with respect to the relative activity of mono- and polyvalent ions. Titration curves, very similar for the colloids of all the four soils studied, are also reported, together with cata-

phoresis experiments, in which at from pH 10.0 to 2.5 the colloids all indicated a negative charge. Lysimeter studies indicated that in all cases lime and manure applications, singly or in combination, increased the percolation, and field trials showed that 1 ton of sulfur or 4 or 5 tons of gypsum used with a light application of manure were effective for structure improvement in sodium saturated black alkali land.

Forest soil acidity, E. FRANK (*Über Bodenazidität im Walde. Freiburg i. Br.: Speyer & Kaerner, 1927, pp. VIII+155*).—Part 1 of this monograph reviews the literature of the subject of soil acidity to the end of 1925, discussing the nature and importance in general of soil acidity, its varieties, its origins, and its influence upon plants, methods for determining both the H-ion concentration and the titrable acidity, and soil buffer action as determined by both electrometric and biological means. Part 2 reports at length on the examination of some 2,500 forest soil samples with a view to ascertaining the form and degree in which acidity appears in forest soils; the influence of locality; the significance of acidity for native plants, and plant varieties capable of use as soil acidity indicators; the influence of acidity on cultivated forest plants; and, finally, the relation of acidity to forestry, and forestry methods suitable to be used in connection with it.

The findings are in part as follows:

The soils of the forest area investigated were mostly acid, the figures for the H-ion concentration ranging between pH 3 and 8, while the total titrable "acidity" varied from a titrable alkalinity equivalent to 1.3 cc. N hydrochloric acid to an acidity equivalent to 180 cc. of N sodium hydroxide. The degree of acidity varied both horizontally and vertically, the acidity in general falling off in the lower levels. Within the surface 20 cm. the acidity was found dependent upon a number of factors, including the density of the stand, the height above sea level, the soil cover, and the mineral origin. Humus soils were found the most acid, the degree of decomposition giving some indication of the acidity; and, in general, the humus content is considered the most important factor in the production of soil acidity. Loam and clay soils showed a stronger buffer action than did sandy soils. Among original minerals, granite and gneiss showed the highest acidity. An influence of local climate could be demonstrated, and the pH value showed seasonal variations. A number of conclusions with respect to the various effects of soil acidity are also given.

The effect of hydrogen-ion concentration on the growth of certain plants, W. L. POWERS (*Soil Sci., 24 (1927), No. 1, pp. 1-7, pls. 2*).—In contradistinction to the results of Bryan (*E. S. R., 49, p. 825*), this contribution from the Oregon Experiment Station presents evidence to the effect that certain plants, including the legumes alfalfa, alsike clover, and Hungarian vetch, show both in pot experiments and in solution cultures a preference for slightly acid media. The culture solutions used in these experiments were made up to have an osmotic pressure equivalent to one atmosphere, the salts employed being dipotassium phosphate, acid potassium phosphate, calcium nitrate, calcium sulfate, and magnesium sulfate, with an addition of 300 parts per million of potassium acid phthalate to improve the buffer action. In the case of the legumes but 20 parts per million of nitrates were used, this minimum amount being found necessary, however, to support the growth of the seedlings until bacteria and nodules could develop. The growth periods were from 4 to 10 weeks.

Tabulated data showing the relative yields of plant substance from solution cultures at various pH values, the H-ion concentration of the soil solution in the pot experiments, and the yields of plant substance in pot experiments, together with five photographs, are adduced in support of the conclusion that

all the plants studied, these including spearmint and rhododendron as well as the legumes mentioned above, grow best in a slightly acid medium. The Hungarian vetch grew best at pH 5.3, the spearmint at pH 6.0, the alsike clover at from pH 5.5 to pH 6.0, and the rhododendron at pH 5.0. Alfalfa developed the greatest number of nodules at pH 5.8 to pH 7.0, though the largest total plant growth was, as for the legumes in general, within the range of pH 5.2 to pH 6.5. With rhododendron in media having the optimum reaction of pH 5.0, as little as 2 parts per million of aluminum was found toxic. Mint tended either to control the reaction of its growth medium promptly or to fail to survive. When sulfur, sulfates, and other treatments tending to an acid reaction were applied, increased growth was concomitant with the acidifying treatment. Field soils in which the plants studied were found to flourish showed a slight acidity wherever the reaction was determined.

Carbon dioxide evolution of soil and crop growth, H. LUNDEGÅRDH (*Soil Sci.*, 23 (1927), No. 6, pp. 417-453, pls. 2, figs. 18).—This paper comprises sections on soil respiration, the carbon dioxide concentration in the soil air, carbon dioxide production at different depths, diffusion value as an indication of soil aeration, the influence of climatic conditions and fertilizers on soil respiration, and on the relation of soil respiration to crop growth; together with descriptions and illustrations of two forms of apparatus for the determination of the carbon dioxide content of air, an apparatus for the estimation of soil respiration, and a device for the sampling of soil air, a borer for the securing of soil samples of definite volume at various depths, a tubular grating for the artificial distribution of carbon dioxide in field plats, a portable field apparatus for carbon dioxide determinations, etc.

The main general indication of the numerous experiments, summarized in the 13 tables and 6 graphic or diagrammatic figures, is that an increased carbon dioxide supply up to or nearly to the limit of tolerance markedly increases the yield of total dry matter in the crop. One of the especially striking experiments reported consisted in placing impervious troughs of asphalted felt in furrows between rows of beets and filling the troughs with manure. Although no part of the manure save the evolved gases reached the plants, an increase in yield closely similar to that obtained by supplying carbon dioxide from mineral sources was produced, analysis of the soil air among the leaves indicating the carbon dioxide from the manure as the sole cause of the difference between the experimental and check rows. The content of the paper in general can not be adequately represented, especially with regard to the apparatus described and the very large amount of actual experimental data assembled, in abstract form.

A comparative study of the bacterial flora of wind-blown soil.—II, Atlantic coast sand dunes, Sandwich, Massachusetts, L. M. SNOW (*Soil Sci.*, 24 (1927), No. 1, pp. 39-49, pl. 1).—By means of methods essentially similar to those employed in the first contribution of this series (*E. S. R.*, 55, p. 621), bacterial forms from various depths in the Sandwich dune sands were isolated, their cultural and morphological characteristics being recorded in the present communication.

The organisms were most abundant in the upper 6 in. of these soils. Seventy-five per cent of the organisms found were bacteria and yeasts, 24 per cent were actinomycetes, and 1 per cent were fungi. Forms producing white colonies predominated, though yellow, red, brown, and fluorescent forms were also found. Blue, purple, and black colonies did not appear. Short rods were most abundant, followed by cocci, sporogenous long rods, and nonsporogenous long rods. There were nearly twice as many Gram negative as Gram positive forms.

No gas was formed in sugar media by any of the organisms, and there were but few and doubtful cases of lactose fermentation. Glucose was fermented by one-third and sucrose by one-fourth of the forms isolated. One-half of the forms digested casein and reduced litmus, and two-fifths digested gelatin. About one-fourth of the forms reduced nitrates. These results are compared with those obtained in the previous study.

The possible rôle of iron-depositing bacteria in the formation of hardpan. C. S. MUDGE (*Soil Sci.*, 23 (1927), No. 6, pp. 467-473, pls. 2).—This is a note from the California Experiment Station, reporting the isolation from iron hardpan of bacterial forms, both rods and cocci, capable of fermenting neutral nutrient solutions containing ferric ammonium citrate with the precipitation of the iron and a shift of the pH toward the alkaline side; together with the observation of filamentous threads believed to be Chlamydobacteriaceae. The deposit of iron by organisms such as those isolated in this study is suggested as a very plausible explanation of the iron hardpan formation.

The relative rates of nitrification of different parts of sweet clover plants. A. L. WHITING and T. E. RICHMOND (*Soil Sci.*, 24 (1927), No. 1, pp. 31-37).—Continuing the previously noted study (E. S. R., 43, p. 212) of the nitrification rate of clover, the present report from the University of Illinois records data on the total nitrogen content of the leaves, stems, and roots of white sweet clover and on the proportion of the nitrogen of these parts soluble in water and in N salt solutions, together with the relative nitrification rates noted when these were added to the soil in the proportion of 15 mg. of nitrogen per 100 gm. of soil. The progress of the nitrification was determined at monthly intervals for 8 months.

It is concluded that though the clover roots had a lower percentage of total nitrogen than did the leaves or stems, their nitrification rate is greater. This is explained as probably due to the high relative content of water-soluble nitrogen in the roots. The domination of the early stages of the whole-plant nitrification by the roots is considered due to the fact that the roots contain 66 per cent of the total nitrogen of the plant, and that a very large proportion of the root nitrogen is water-soluble. The apparent nitrification of the leaves to the extent of 100 per cent at the end of 3 months, with a further increase of the apparent nitrification to 141.3 per cent at the end of 8 months is tentatively explained as the result of a stimulation of soil nitrate production.

Green manuring: Principles and practice. A. J. PIETERS (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. XIV+356, figs. 80*).—Neither the thoughtless optimism of ignorance nor the extreme opposite view, that population must ultimately exceed the food supply, is considered a logical conclusion; but the avoidance of the latter contingency depends, in the author's belief, upon the following up of every possibility for the maintenance and increase of the productivity of the soil. Such a possibility, and an important one, is believed to be presented by the practice of green manuring.

The author considers himself as compiler rather than as an original worker in the preparation of the present volume, but he has contributed much in the form of the discussion which accompanies the material that has been collected to form this book. The contents are as follows, each chapter being provided with a summary: History of green manuring; organic matter; the nitrogen problem; nitrogen fixation; chemical composition of green-manure plants; decomposition of green manures; benefits other than increase in nitrogen, types of green manuring; various practical considerations; yields after green manuring; crops used for green manuring; green manuring in the United States; green manuring in other countries; and economics of green manuring.

[Fertilizer experiments at the Kentucky Station] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 16-18*).—The following experiments are included in this report:

Sulfonation in soils.—In experiments on the sulfofying power of 80 or more soils representing the principal geological divisions of the State, the addition of calcium carbonate increased the oxidation of added sulfur in all except 1 of 7 samples, and seemed to retard or prevent sulfonation of sulfur compounds originally present in 4. It is suggested that sulfofying organisms thriving under alkaline conditions predominate in some soils, whereas in others sulfofying organisms favored by an acid soil condition predominate.

The occurrence and distribution of manganese.—Field experiments with manganese as a cure for chlorosis suggest that manganese is of importance in the synthesis of chlorophyll, and that some plants require more of it for normal growth than others. In sand culture experiments, traces of copper, zinc, and boron appeared also to have some important function in the fructification of buckwheat plants, and a small amount of copper apparently has an additional beneficial effect on the growth of corn in connection with manganese.

Rats fed a synthetic diet containing small amounts of organic compounds of manganese, copper, zinc, and nickel lived longer and attained a larger weight than rats on diets from which these elements were largely excluded. Rats made a fairly normal growth when fed fresh green blades of Kentucky bluegrass air-dried in the shade and finely ground, but not so well on chlorophyll-free bluegrass blades. The alcoholic extract of these blades contained small amounts of copper, manganese, and zinc compounds, in connection with iron, phosphorus, magnesium, potassium, and sulfur, but no calcium.

[Soil work at the Porto Rico Insular Station, 1926] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926, Spanish ed., pp. 59, 60*).—A pineapple plantation producing excessively small fruit was studied, with the result that a potash deficiency in the soil was discovered. The application of a mixture of acid phosphate and sulfate of potash was followed by good results.

A reported tobacco disease which could not be traced to any pathogenic organism or to an insect and was referred to the department of chemistry indicated a potash hunger. On a sugar plantation where a progressive diminution in the yield had been noted in a part of its fields, a saline soil content constantly augmented by saline waters used for irrigation was discovered.

The use of chemical fertilizers in horticulture, J. FRITSCH (*Emploi des Engrais Chimiques en Horticulture. Paris: Amédée Legrand, 1927, 2. ed., rev. and enl., pp. VIII+256, figs. 31*).—This second edition, besides being enlarged by the addition of chapters on the utilization of blast furnace carbon dioxide and on a simple device for the utilization of atmospheric electricity (for which somewhat remarkable results are claimed), as well as by miscellaneous additions required to bring the treatment up to date, presents its subject of the use of fertilizers in horticulture and market gardening in a form better adapted to the use of those having but a limited scientific education than that of the first edition of 1912. The chapter headings of the present edition are as follows: The life of the plant (pp. 1-29), the rôle of the water of the organic matter and of the mineral substances in plants (pp. 30-39), the soil (pp. 40-54), the rôle of chemical fertilizers in horticulture and market gardening (pp. 55-97), the use of chemical fertilizers in the raising of vegetables (pp. 98-142), the fertilization of fruit trees (pp. 143-163), vineyard fertilizers (pp. 164-177), lawn grass, garden flowers, and ornamental plants (pp. 178-188), small gardens (pp. 189-200), chemical fertilizers in silviculture (pp. 201-207), carbon dioxide from blast furnaces and lime furnaces for plant fertilization in agriculture and horticulture (pp. 208-220), and economic utilization of earth

and atmospheric electromagnetism in horticulture (pp. 221-243). There is an appendix on the destruction of slugs in gardens and fields (pp. 244-247).

Air-nitrogen fertilizers, H. J. WHEELER (*Amer. Fert.*, 67 (1927), No. 5, pp. 19-26).—The history of experiments on the fixation of atmospheric nitrogen, from Cavendish's observation in 1781 that nitric acid is produced when hydrogen is burned in air, through the experiments of Moissan, Frank and Caro, and others to the Haber-Bosch, and other modern ammonia processes are first briefly sketched. The manufacture, general properties, and use as fertilizers of such compounds and mixtures as calcium cyanamide, Ammo-Phos, Leunasaltpeter, calcium nitrate, urea, ammonium nitrate, Nitrophoska, ammonium bicarbonate, ammonium chloride, and calcium ammonium nitrate are then taken up in from one to several paragraphs each, the work of a number of experiment stations being quoted in support of the conclusions reached in the cases of several of the compounds and mixtures discussed.

AGRICULTURAL BOTANY

Data of biology, edited by K. VON FRISCH ET AL. (*Ergebnisse der Biologie*. Berlin: Julius Springer, 1926, vol. 1, pp. VIII+670, figs. 130; 1927, vol. 2, pp. VI+729, figs. 177).—The first of these volumes, though it deals mainly with animal life, contains a section on sap rise in plants, by F. Bachmann (pp. 343-379); one on the behavior of plants toward salts, by H. Kaho (pp. 380-406); and one on ammonia, nitrates, and nitrites as nitrogen sources for higher plants, by D. N. Prianishnikov (pp. 407-446).

The second volume contains, besides contributions on phases of animal life, several sections on plant life, dealing with the problem of stimulation conduction, by P. Stark (pp. 1-94); the Blaauw theory of phototropism, by L. Brauner (pp. 95-115); the georeactions of plants, by W. Zimmermann (pp. 116-256); urea in plant economy and its relation to albumin, by A. Kiesel (pp. 257-310); and the phenomenon of heteroploidy, particularly in the plant kingdom, by F. von Wettstein (pp. 311-356).

Biology of the flowers, fruits, and young regeneration of *Olinia cymosa* Thunb. ("hard pear"), J. PHILLIPS (*Ecology*, 7 (1926), No. 3, pp. 338-350).—Information has been collected regarding the biology of the flowers, fruits, and young regeneration of *O. cymosa*, a forest tree of some importance at Knysna, Union of South Africa. Discussion is given of the pollination and fertilization of the flower and of pollinating agents, despite the abundance of which the degree of fertilization is low. An aphid larva produces considerable hypertrophy in the various floral members and thus affects the production of fruits. Seasonal developmental phases of the flowers are indicated. The prime factors influencing growth of the regeneration are separately discussed. Light intensity supposedly plays an important part. The effects of severe insolation are indicated in connection with the corresponding temperatures.

Soils of medium total moisture content are favorable, soils of high total moisture unfavorable, to regeneration. A soil reaction of pH 7.5 to 5.0 is favorable, and of pH 4.5 to 4.0 unfavorable.

Biological causes of plant anomalies, P. VUILLEMIN (*Les Anomalies Végétales: Leur Cause Biologique*. Paris: Presses Univ. de France, 1926, pp. XIX+357).—The first 12 chapters deal with anomalies of the reproductive apparatus, the remaining 15 with anomalies of the vegetative portions.

Relationship between growth factor and yield [trans. title], K. BORESCH (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 2 (1926), No. 4-5, pp. 380-405, figs. 3).—The results of an attempt to show quantitatively the relationships between the growth factor and yield are expressed equationally.

Germination of seeds under water, T. MORINAGA (*Amer. Jour. Bot.*, 13 (1926), No. 2, pp. 126-140, figs. 3).—Of 78 genera in 24 families, 43 genera germinated in water. Of the remaining 35, some which did not germinate under the conditions of the experiment germinated if fewer seeds were placed in the flask of water.

Of the 43 genera which germinated in water, 18 showed no decided difference between the germination in water and that on filter paper, and 2 genera germinated better in the water. Ability to germinate in water pertains rather to smaller size than to phylogeny or to reserve material in the seeds. Of 21 kinds of seeds which germinated well in distilled water, 20 germinated in boiled distilled water covered with paraffin oil. Several seeds which did not germinate in water germinated when the water was in contact with pure oxygen in place of air.

White clover (*Trifolium repens*) germinated as well in water as on filter paper at optimum temperature (15° C.), but gave nearly 10 times as large percentage of germination in water as on filter paper at 32 and 38°. Germination of white clover seeds was increased by treatment or removal of seed coats on filter paper at 38°, and more so in water. White clover seeds germinated in boiled water sealed with paraffin oil, but not in a vacuum at the optimum temperature. They germinate better in a sealed air chamber over water than in common Petri dishes at 32°, and still better in 60 per cent hydrogen mixture with air, but 60 per cent nitrogen mixture was not as favorable as air. Sweet clover (*Mellilotus*) seeds germinate equally well in water and on filter paper at high or low temperatures, but much more quickly in water at high temperature than on filter paper. Red clover (*T. pratense*) and alfalfa (*Medicago sativa*) germinate equally well at the optimum temperature in water and on filter paper, but not so well in water as on filter paper at temperatures above the optimum. Celery (*Apium graveolens*) germinates more slowly in water, but shows no difference in germination percentage. Water cress (*Roripa nasturtium*) germinates better in water than on filter paper when the temperature is higher than the optimum (15°), and these seeds have also a higher maximum temperature in water.

Effect of alternating temperatures upon the germination of seeds, T. MORINAGA (*Amer. Jour. Bot.*, 13 (1926), No. 2, pp. 141-158, figs. 5).—Alternating temperatures were effective in germination of seeds of *Cynodon dactylon*, *Poa compressa*, *Typha latifolia*, *Apium graveolens*, and *Berberis thunbergii*. Particular differences are detailed. Light and nitrate as well as nitrite were effective in the germination of *Cynodon* seeds when applied together with alternating temperatures. Effects were more striking with *Poa* seed, germination being increased at both constant and alternating temperatures, though the highest percentage was obtained when the three factors were combined. Nitrate did not affect the germination of celery seeds, and light was effective in germination only when unfavorably high temperatures were used.

Mechanical treatment or treatment with concentrated sulfuric acid was effective in forcing the germination of *Cynodon* and *Typha* seeds at constant temperatures. *C. dactylon*, *P. compressa*, and *T. latifolia* seeds germinated in boiled distilled water covered with paraffin oil; but *C. dactylon* and *T. latifolia* seeds, with coats entire or broken, did not germinate in a vacuum.

The change of opposite to alternate phyllotaxy and repeated rejuvenations in hemp by means of changed photoperiodicity, J. H. SCHAFFNER (*Ecology*, 7 (1926), No. 3, pp. 315-325, fig. 1).—The change in leaf arrangement of the typically opposite-leaved hemp (*Cannabis sativa*) becomes usually a regular occurrence toward the end of the sporophyte ontogeny, but it can be

induced at a much earlier stage by environmental control. The phylogenetically more primitive alternate heredity is normally latent during the greater portion of the vegetative development, while the more modern and specialized heredity for opposite phyllotaxy is active. This activity or latency depends on physiological gradients, which can be controlled to a considerable extent through ecological factors. Hemp plants brought to blooming with the short light period of winter and then exposed to continuous illumination by using electric light at night will rejuvenate from the terminal bud, both staminate and carpellate, and continue growth with alternate phyllotaxy. Hemp plants coming to the blooming stage in early spring when the days are beginning to lengthen decidedly will in some instances rejuvenate naturally, usually from lateral buds below the inflorescence. Other instances and particulars are noted.

The mechanics of water separation from living plant cells [trans. title]. A. WEIS (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 2 (1926), No. 2-3, pp. 241-248, fig. 1).—An account, partly of experimentation but largely of published results of studies, is given regarding the factors concerned in the separation of water by plant cells.

The relations between water content and photosynthesis in leaves, R. H. DASTUR (*Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), pp. 213, 214).—Testing the view that the lowering of assimilation in some leaves is due to inadequate water supply, the author devised apparatus to measure the rate of assimilation of an attached leaf under uniform conditions, identical with those of the plant. It was found that in case of different leaves of the same plant, a low rate of assimilation accompanies a low water content, a high assimilation rate a high water content. Although very close correlations have been established, it is not maintained that the photosynthetic activities of a leaf depend mainly on the water content.

On the osmotic values in the cell sap of some salt desert plants [trans. title], A. V. BLAGOVESHCHENSKIĭ (BLAGOVESHCHENSKI), V. A. BOGOLŪBOVA (BOGOLUBOVA), and T. A. CHERNOVA (*Būl. Sred. Aziatsk. Gosud. Univ. (Bul. Univ. Asie Cent., Tachkent)*, No. 14, (1926), pp. 3-8; *Eng. abs.*, p. 8).—Cell sap density determinations on desert plants in west Ferghana led to the conclusion that osmotic value is not a characteristic property of plants on so-called physiologically arid soils, as under like conditions plants with similar ecological characters show very different osmotic values for their leaf cell epidermal cell sap. As examples, *Alhagi camelorum* shows a pressure of 21.6 atmospheres. *Sophora alopecuroides* 108.0 atmospheres. On the other hand, separate plants of some species show equal osmotic pressures in greatly differing habitats.

On the pH values of plants and those of corresponding soils [trans. title]. A. V. BLAGOVESHCHENSKIĭ (BLAGOVESHCHENSKI), N. I. SOSEDOV (SOSSIEDOV), and A. G. TOSHCHEVIKOVA (TOSCHEVIKOVA) (*Būl. Sred. Aziatsk. Gosud. Univ. (Bul. Univ. Asie Cent., Tachkent)*, No. 14 (1926), pp. 9-16; *Eng. abs.*, p. 16).—The authors found the pH values (investigated by the indicator method) at soil depths of 10 to 20 cm. to be nearly constant, around the value 7.8 ± 0.003 . The pH values, as tabulated, for leaf expressed juices of various plants were more diverse, ranging in single cases from <3.0 to 8.2.

The permeability to sugar of plasmolyzed protoplasts [trans. title], K. HÖFLEB (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 2 (1926), No. 4-5, pp. 454-475).—The plasma of plant cells is permeable to sugar in a measurable degree.

The physiological rôle of tannins and their importance to the maturity of grapevines [trans. title], F. PICARD (*Rev. Vitic.*, 62 (1925), No. 1608, pp.

322-324).—In the author's account of a communication presented to the Academy of Sciences by H. Lecomte, it is claimed to have been shown that it is impossible to determine the degree of maturity by the proportion of the elements or according to the amount of starch and of tannin.

Injection experiments on plants, S. R. BOSE (*Indian Sci. Cong. Proc. [Calcutta], 13 (1926), pp. 212, 213*).—Injection, by a method which is briefly described, of a very dilute solution (0.25 per cent) of ferrous sulfate into stems of chlorotic plants of *Mimosa pudica* which had become completely yellowed restored the plants to their normal green color in 3 to 4 days. A solution at 0.5 per cent was also effective, but at 0.1 per cent was unsatisfactory. Like solutions applied to the soil produced feeble and slow response. Yellowed *Mimosa* plants injected only with very weak sulfuric acid solution (1 drop in 100 cc. of water) turned green in 5 or 6 days, and a similar response was obtained with *Ixora coccinea* in 11 days. It is thought that the yellowing of plants may be due not to the absence of iron but to its precipitation in some form within the plant. The acid may mobilize the iron, thus rendering it available physiologically. This view is supported by the fact that, of *Mimosa* plants growing on the same spot in the same soil, some were yellow and others green and normal. These results are to be followed up with chemical analyses.

The effects of sulfur dioxide upon plants: Methods of study, L. A. WEIERBACH (*Amer. Jour. Bot., 13 (1926), No. 2, pp. 81-101, pl. 1, figs. 4*).—Pure sulfur dioxide may be obtained from sodium bisulfite by the use of the method and apparatus here described. Decrease of sulfur dioxide was found to be due to absorption by plants and soil, adsorption on surfaces, oxidation from sulfur dioxide to sulfur trioxide, and probably other causes. Oxidation from sulfur dioxide to sulfur trioxide is relatively rapid. Adsorption and oxidation were less active in low temperatures than in high ones, in contact with paraffin than with glass surfaces, and with increase of the degree of saturation of surfaces. The method developed was compared with that used by the Selby Smelter Commission in 1915 (*E. S. R., 34, p. 716*), and was found to be more accurate for determining sulfur dioxide in dilutions needed for minimal injury to plants. The advantages of the method are supposed to include reduction of the glass surface on which sulfur dioxide may be lost to a minimum, avoidance of reduction of the iodine by elimination of rubber near an iodine solution, and correction for vapor pressure. The method is believed to be accurate for one part of sulfur dioxide in a million parts of air-gas mixture, and fairly accurate for two parts in ten million.

Effects of certain acids and their sodium salts upon the growth of *Sclerotinia cinerea*, M. S. DUNN (*Amer. Jour. Bot., 13 (1926), No. 1, pp. 40-58, figs. 5*).—A study of *S. cinerea* descended from a single spore culture is reported as carried out with acids and their sodium salts. It is stated that sodium hydroxide remains practically harmless in changing the pH from 3.8 or 4.0 to 5.2 or slightly higher. A slight acidity benefits growth, preferably between pH 2.85 and 3.9. Within a fairly narrow zone on the acid side, growth is limited for each acid used.

The general order of toxicity for solutions under the conditions of these experiments at pH 4.70 is salicylic > butyric > sulfuric > formic > acetic > phosphoric, while at pH 4.50 acetic is more toxic than sulfuric, and at pH 4.4 formic is also more toxic than sulfuric.

A comparison of the toxicity of the acids on a basis of normality gives the general order: Butyric > salicylic > acetic > formic > sulfuric > phosphoric. This is the order that would be expected from the comparative ease of penetration of the acids into the living cell as has been shown in other investigations. The anion of butyric acid may be relatively toxic,

The toxicity of the fatty acids used and of salicylic acid is thought probably to be due chiefly to the undissociated molecules, with the H-ion playing a secondary rôle. On the other hand, the H-ion is the principal factor of toxicity in the case of the mineral acids used.

These results show that the H-ion is not always the chief factor of toxicity in the effect of various acids upon the germination and growth of fungus spores.

Comparative morphology of fungi, E. GÄUMANN (*Vergleichende Morphologie der Pilze*. Jena: Gustav Fischer, 1926, pp. X+626, figs. 398).—A brief section dealing very generally with the fungal vegetative bodies, the fruiting organs, sexual organs, and sexuality, with a short bibliography, is followed by the main part of the treatise, dealing with the morphology of groups separately considered, with bibliog: phy, and a section on the fungi imperfecti, concluding with a review of the system as a whole.

Intermediate products in assimilation and respiration of autotrophic bacteria [trans. title], G. KLEIN and F. SVOLBA (*Ztschr. Bot.*, 19 (1926), No. 2, pp. 65-100, figs. 2).—The authors present data claimed to be new as to the physiology of autotrophic bacteria, some on the action of unfavorable pH values.

Bacterial root symbiosis in some Leguminosae [trans. title], D. FEHÉR and R. BOKOR (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 2 (1926), No. 4-5, pp. 406-413, figs. 4).—A study was made of the simultaneous symbiosis of *Bacterium radiclecola* and *Bacillus mycoides* with root nodules of *Amorpha fruticosa*, which seems to require, as a condition of optimum growth, the simultaneous presence of these two bacteria. *B. mycoides* is unconditionally aerobic, and it therefore occupies perforce only the inner portions of the bacteroidal tissue formed by *B. radiclecola*. Relationships in other forms are briefly noted.

Seeds and plants imported by the Office of Foreign Plant Introduction, Bureau of Plant Industry, during the period from January 1 to March 31, 1925 (*U. S. Dept. Agr., Inventory 82* (1927), pp. 60).—Annotated lists are given of more than 1,200 lots of plant material received for testing.

GENETICS

Mendel's letters to Carl Nägeli, M. M. LESLEY (*Amer. Nat.*, 61 (1927), No. 675, pp. 370-378).—Certain significant points brought out in Mendel's letters to Nägeli are reiterated and discussed.

Preliminary notes on reptilian chromosomes.—I, The chromosomes of some snakes, K. NAKAMURA (*Imp. Acad. [Japan], Proc.*, 3 (1927), No. 5, pp. 296-298, figs. 9).—Studies of the male germ cells of the snakes *Natrix tigrina*, *Agkistrodon blomhoffii*, and *Elaphe quadrivirgata* have shown that the males are homozygous as regards the sex chromosomes. The chromosome counts of the males for the respective species were 38, 34, and 34+ZZ. The sex chromosomes were identified as a pair of short rodlike bodies.

Artificial transmutation of the gene, H. J. MULLER (*Science*, 66 (1927), No. 1699, pp. 84-87).—By treating the spermatozoa of *Drosophila melanogaster* with relatively heavy doses of X-rays, it has been possible to induce detectable mutations in the X chromosome of approximately a seventh of the offspring. The mutations, when followed through several generations, proved to be relatively stable in their mode of inheritance. Lethals and semilethals were the most numerous types of mutations, but a large number caused sterility when heterozygous. Numerous mutations already known and studied were produced by the method employed. Most of the mutations were recessive, though some

were dominant. The X-ray treatment also caused a high proportion of rearrangements in the linear order of the genes as evidenced by hereditary disturbances.

The action of X-rays were not limited to the sperm cells, as similar results were associated with the treatment of unfertilized females during the time when the ova were in oocyte and early oögonial stages.

In studying the genetic composition and behavior of the chromosomes and genes it was found that the mutations did not involve a permanent alteration of all the gene substance present at a given locus, but affected only a portion of that substance, or else the complete effect occurred subsequently as an after-effect in one of two or more descendent genes. Preliminary studies of these points indicate the validity of the former hypothesis and thus point to a compound structure for the gene. However, such a hypothesis does not conform to the stability of the mutants through several generations.

Further experiments have indicated that factors other than X-rays may also induce mutations, temperature particularly being another factor.

Morphological and cytological studies of an oat from Ethiopia, T. R. STANTON and E. DORSEY (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 804-818, figs. 9).—Agronomic study of cultures suggests that an oats obtained from northeastern Africa represents a cultivated form of *Avena abyssinica*. While it resembles *A. strigosa*, it is evidently not as closely related to that form as morphological characters would indicate. Chromosome counts show it to represent a second species with a haploid number of 14, and it can not be considered as closely related cytologically to *A. westii* (haploid 7). Apparently no correlation exists between the chromosome numbers and the external morphological characters of these oats forms. In so far as origin is concerned, external morphological characters alone may not show the exact degree of relationship.

The cytology of certain hybrid wheats, Marquillo and H-44-24, A. T. ELDERS (*Sci. Agr.*, 8 (1927), No. 2, pp. 105-111, figs. 17).—Cytological studies were made at the Manitoba Agricultural College on Marquillo wheat (derived from Iumillo \times Marquis) and on F_1 of a cross between H-44-24 (from Marquis \times Yaroslav emmer) and Marquis. Marquillo and H-44-24 are relatively stable segregates and exhibit both emmer and common wheat characters.

The cytological behavior of Marquillo seemed to be quite regular, there being 21 normal bivalent chromosomes at the metaphase of the heterotype division, suggesting that it would breed true. H-44-24 when crossed with Marquis showed an abnormal pairing of the chromosomes at the metaphase of the heterotype, indicating that the usual known ratios would not be expected.

A low temperature type of albinism in barley, J. L. COLLINS (*Jour. Heredity*, 18 (1927), No. 7, pp. 331-334, fig. 1).—An albino type of barley studied at the University of California is said to appear only when the plants are grown below 45° F. Plants of this type grown above 65° develop chlorophyll normally. The F_1 of hybrids between this albino and normal barley and the segregation of F_2 indicated that a single recessive gene produces the albino type. Limited change in light intensity seemed without marked effects.

The expression of Mendelian factors in the gametophyte of maize, P. C. MANGELSDORF and D. F. JONES (*Genetics*, 11 (1926), No. 5, pp. 423-455, figs. 4).—This contribution from the Connecticut State Experiment Station describes the ways in which gametophytic factors may operate and their effects on Mendelian ratios in the sporophyte.

Illustrative material includes a stock of corn (E. S. R., 55, p. 428) segregating for defective seeds, *de*, which regularly produces high ears with approximately

33 per cent recessives, normal ears with 25 per cent recessives, and low ears with 17 per cent recessives. These results are explained by assuming a factor, *Ga*, which has its expression in the gametophyte generation, stimulating the rate of pollen tube growth. *Ga* is linked with *de*₁ and in the coupling phase causes an excess of recessives; in the repulsion phase, a deficiency. The cross, sugary × Rice Pop, indicates the presence of a similar gametophyte factor linked with *Su* in the Rice Pop parent. The percentage of sugary seeds in *F*₂ is 16.2. *Su* and *de*₁ are linked, with 39 per cent of crossing over, and the gametophyte factor in both stocks is probably the same. On this assumption the *Ga* gametes appear to accomplish fertilization 4.1 times as frequently as *ga* gametes, and the crossing over between *Ga* and *de*₁ appears to be 24.3 per cent and that between *Ga* and *Su* 21.2 per cent.

Gametophyte factors probably account extensively for the peculiar results obtained in mixed pollination experiments. An analysis of Kempton's data (E. S. R., 41, p. 437) indicates the presence on the waxy chromosome of a gametophyte factor causing distortions in the starchy: waxy ratio.

A defective endosperm in the heterozygous condition as related to yield in maize, R. J. GABBER and H. K. ROWLEY (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 797-803).—The effect on yield, plant height, and number of nodes of a certain defective endosperm noted by Wade (E. S. R., 55, p. 129) in the heterozygous condition in a strain of Leaming corn selfed for four and five years was studied at the West Virginia Experiment Station. When homozygous, this character profoundly influences the growth of the plant, yet when heterozygous plant growth is apparently very little affected. Heterozygous defective plants of this strain could not be distinguished in the field from homozygous normal plants, although the normal plants averaged about one-third more in 1925 and one-fourth more in 1926 in yield than the heterozygous defective plants. The weight of seed planted, the degree of infection with root rot, and the number of nodes were similar. The heterozygous defective plants were about 5 in. taller in 1925, while significant differences were not found in 1926.

A comparison of selfed lines of corn and first generation crosses between them, L. JORGENSEN and H. E. BREWBAKER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 819-830).—A companion study to that of Nilsson-Leissner (E. S. R., 57, p. 519) dealt with the relationships between certain characters of inbred lines of Silver King white dent corn and of *F*₁ crosses between them.

Some of the hybrids of the selfed lines were distinctly superior as parent crosses. Positive and significant correlations were observed between the yield in grams per hill, length of ear, diameter of ear, number of kernel rows per ear, stalk height, and weight of seed of the parents and the same characters of the *F*₁ hybrids. A multiple correlation calculated with the *F*₁ yield as the dependent variable, and length of ear, diameter of ear, number of kernel rows per ear, height of plants, and yield in grams per hill of the parents as the independent factors was 0.6074. These characters of the parental lines accounted for about 20 per cent of the variability of yield of the *F*₁ hybrids. Selection of the most vigorous selfed lines for the production of single and double crosses or synthetic varieties appeared to be the proper procedure for the practical corn breeder.

The inheritance of red plant color in cotton, J. O. WARE (*Arkansas Sta. Bul.* 220 (1927), pp. 80, figs. 17).—Genetic studies involving Winesap, a red leaf upland cotton and green leaved varieties of upland, sea island, and Egyptian revealed a modified monohybrid mode of inheritance for the red (anthocyanic)

color. F_1 of red \times green is dilute red, and F_2 segregates into 1 red (AA), 2 dilute red (Aa), and 1 green (aa). Both direct and reciprocal crosses give the same ratio. The red color thus appeared to provide a convenient means for determining the extent of natural crossing. Evidently because of seasonal conditions, abundance of plants of the opposite color, and the abnormal visitation of pollen-carrying insects natural crossing in both green and red plants amounted to 40.9 per cent at the station, whereas less than 1 per cent was observed under the more normal conditions at Scott.

Inheritance of awnedness in rice, J. W. JONES (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 830-839, fig. 1).—The inheritance of awnedness in rice was investigated at the Biggs (Calif.) Rice Field Station, using Butte (fully awned \times Colusa (awnless) and Colusa \times Italian Red (partly awned).

The awned condition was partly dominant to awnlessness in F_1 , and the F_2 of the Butte \times Colusa segregated in the phenotypic ratio of 9 awned to 6 partly awned to 1 awnless plants, while the ratio of the F_2 of Colusa \times Italian Red was about 3 partly awned to 1 awnless plant. The data indicated that two independent genetic factors are involved in the inheritance of awnedness in Butte \times Colusa and one genetic factor in Colusa \times Italian Red.

Effect of a semi-lethal factor upon yield in soybeans when present in the heterozygous condition, J. B. WENTZ and R. T. STEWART (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 850-853).—The mean yields of F_1 soy bean plants homozygous normal and of F_2 plants of the same progenies but heterozygous for the glabrous factor (E. S. R., 56, p. 632) were 38.01 and 34.17 gm. per plant, respectively. While the odds did not indicate with certainty that the semi-lethal factor has had any effect upon yield, it seemed possible that extensive experiments with this semilethal factor would show a more conclusive difference in favor of the homozygous normal plants.

Studies on self-sterility, VI, VII (*Genetics*, 9 (1924), No. 1, pp. 13-40, fig. 1; 11 (1926), No. 5, pp. 466-481, fig. 1).—The sixth and seventh papers of this series (E. S. R., 42, p. 527) are presented.

VI. *The genetic basis of cross-sterility in Nicotiana*, E. Anderson.—The same system of interfertile, intrasterile classes was found to exist in *N. forgetiana* and in *N. alata* as had been observed earlier in their hybrids and in other self-sterile species of *Nicotiana*. There were at least 24 such classes among the few strains of *N. forgetiana*, *N. alata*, and *N. alata \times *N. forgetiana* that were studied. These phenomena were interpreted as due to the action of certain heritable factors. Plants cross-sterile with each other (i. e., belonging to the same class) have certain essential factors in common, whereas plants cross-fertile with each other (in different classes) differ for these factors.*

VII. *Heredity and selective pollen-tube growth*, E. M. East and A. J. Mangelsdorf.—Detailed evidence, on which a new genetic interpretation of self-sterility (E. S. R., 55, p. 27) as manifested in *Nicotiana alata grandiflora* and *N. forgetiana* or their hybrids is based, is given. The behavior and inheritance of self-sterility and of cross-sterility in the populations of *Nicotiana* used were shown to be determined by the allelomorphous sterility factors S_1 , S_2 , and S_3 . Their action seems to be such that the growth of pollen tubes carrying a given factor is inhibited in the styles of plants carrying that factor. Reciprocal crosses between plants having one of the sterility factors in common give unlike progenies, and the sterility group to which the female parent belongs is always absent in the progeny. Populations produced by selfing in the young bud stage show the expected segregation. The S_3 factor in the homozygous condition has produced characteristic abnormalities in habit of growth. A fourth allelomorph pertaining to the same series, S_4 , has been established by tests on new material.

Genetics of domestic fowl, edited by N. K. KOLTZOFF (Kol'tsov) (*Genetika Domashnei Kuritsy*. Moscow: Anikovo Genetical Station, 1926, pp. VII+137+[5], pls. 20, figs. 84; Eng. abs., pp. 125-133).—The results are given of inheritance studies with poultry at the Anikovo Genetical Station, near Moscow, and a proposed decimal system with an international nomenclature for indicating the known characters and adaptable for new mutations for all classes of animals is suggested. The symbols for all the known characters in poultry and groups showing linkage relationships, as well as progress in the study of definite characters or groups of characters, are presented in papers by the different investigators as follows:

Studies on the Genetics of Domestic Fowl, by A. S. Serebrovskii (Serebrovsky) (pp. 1-74, 125-129); The Chromosome-complexes in the Somatic Cells of the Male and Female of Domestic Chicken, by P. I. Zhivago (P. J. Shiwago) (pp. 75, 76, 129); Genetics of the Rate of Feathering, by L. N. Sakharova (Saharova) (pp. 77-87, 130); The Inheritance of Close-feathering, by E. T. Vasina (Wassina) (pp. 88, 130); The Genetic Analysis of the Structure of the Pelvis by Domestic Fowl, by A. N. Promptov (pp. 89-95, 131); The Inheritance of the Size of Erythrocytes, by A. S. Serebrovskii (pp. 95, 131); The Inheritance of the Contents of the Catalase in the Fowl, by N. G. Savich (Savitsch) (pp. 96-99, 131); Genetics of the Growth and Size, by M. R. Sokolov (pp. 100, 101, 132); and Studies on the Genetics of the Egg and Egg Laying, by R. I. and A. S. Serebrovskii (pp. 102-121, 132, 133).

The sex-linked method in poultry breeding, R. C. PUNNETT ([*Gl. Brit.*] *Min. Agr. and Fisheries, Misc. Pub.* 55 (1926), pp. 9, pls. 2).—The practical application of the knowledge of sex-linked characters for the determination of the sex of chicks at hatching is discussed.

Experimental studies on the duration of life.—XI, Density of population and life duration in *Drosophila*, R. PEARL, J. R. MINER, and S. L. PARKER (*Amer. Nat.*, 61 (1927), No. 675, pp. 289-318, figs. 10).—In continuing this series (*E. S. R.*, 51, p. 737), the authors have studied the effect of densities varying from 2 to 200 per ounce vial on the duration of life of *Drosophila*. The results showed that densities under 35 per bottle reduced the length of life as did densities over 35 per bottle.

FIELD CROPS

Breeding crop plants, H. K. HAYES and R. J. GARBNER (*New York and London: McGraw-Hill Book Co.*, 1927, 2. ed., [rev.], pp. XXII+438, pl. 1, figs. 73).—This revision of the volume noted earlier (*E. S. R.*, 45, p. 734) summarizes recent advances in crop plant breeding and includes a new chapter on biometrical methods. The bibliography is amplified.

Grass land: Its management and improvement, R. G. STAPLEDON and J. A. HANLEY (*London and New York: Oxford Univ. Press*, 1927, pp. 159).—This treatise describes types of British grasslands and presents detailed discussion of the improvement, renovation, and management of meadows and pastures. The characteristics of important herbage plants and seeds mixtures for various conditions are set forth, and a bibliography of British contributions to grassland science is appended.

Fertilizing the hay crop, F. S. PRINCE (*Amer. Fert.*, 67 (1927), No. 5, pp. 33, 55, 56, 58).—Although the acreage is extensive, hay yields in New England are not held satisfactory. To remedy the situation, the adoption of a shorter rotation, better fertility upon seeding down, top-dressing during succeeding years, and earlier cutting to control weeds and obtain a better quality of hay are suggested.

The New Hampshire Experiment Station obtained the greatest response from nitrogenous fertilizers in tests largely on a heavy clay loam soil. While from 150 to 200 lbs. of sodium nitrate resulted in an increase of about 0.5 ton per acre, further addition of acid phosphate or potash, or both, added little to the yield, although phosphate treated plats carried more clover than those treated with sodium nitrate alone. Ten tons of manure produced less hay than 200 lbs. of sodium nitrate.

Permanent pastures, M. V. BAILEY (*Ohio Agr. Col. Ext. Bul. 61* [1927], pp. 20, figs. 13).—A practical discussion of the status of permanent pastures in Ohio with instructions in regard to establishment, management, and improvement.

Pasture improvement, T. E. ODLAND, R. J. GABBER, and D. R. DODD (*West Virginia Sta. Circ. 47* (1927), pp. 16, figs. 6).—The causes of poor pastures are described, and practical suggestions are made for plowing and reseeding old pastures, improving pastures without plowing, and for temporary pastures.

Irrigated crop rotations in western Nebraska, C. S. SCOTFIELD and J. A. HOLDEN (*U. S. Dept. Agr., Tech. Bul. 2* (1927), pp. 26, fig. 1).—The effects of rotation and rotation treatment (manure and alfalfa) on crop yields (E. S. R., 51, p. 135; 55, p. 636) were studied at the Scottsbluff, Nebr., Substation in cooperation with the Nebraska Experiment Station and the U. S. Department of the Interior Bureau of Reclamation.

Oats yields from simple rotations were not much larger than those from continuous cropping, whereas increases of greater magnitude were observed in the yields of potatoes and sugar beets. The use of manure or alfalfa in the rotation has resulted in substantial increases in yield for each of the three crops. Oats and potatoes made their larger increases from alfalfa, while sugar beets did better with manure. Potatoes from alfalfa rotations were less injured by scab than those in other sequences.

Continuous winter wheat outyielded continuous spring wheat. Spring wheat rotated with sugar beets yielded more than spring wheat continuous or in rotation with oats. Plowing under the straw did not enhance the spring wheat yield, but incorporating two years of alfalfa in a rotation of spring wheat and oats resulted in a substantial yield increase. Corn in rotation with other crops seemed to give better yields than continuous corn. Grown in a rotation where it followed three years of alfalfa, yields of corn were very satisfactory and appeared to be increasing.

Comparisons showed that by devoting the land to alfalfa for two or three years in each rotation the increased yields are substantially the same as those obtained from an application of manure at the rate of 12 tons per acre.

[Field crops experiments in Kentucky, 1926] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 8-10, 15, 16*).—Application of fertilizer in the hill did not produce better early growth with tobacco, and the average yields favored broadcast applications. Tobacco untreated in the 6-year rotation, tobacco 2 years, wheat 1 year, and clover and bluegrass 3 years, all the crops being removed, averaged 1,348 lbs. per acre. When 10 tons of manure were applied to the first tobacco crop the yield averaged 82 lbs. more, and with 200 lbs. of sodium nitrate on each tobacco crop, 217 lbs. In a 4-year rotation, tobacco, wheat, clover, and orchard grass, tobacco averaged 1,324 lbs. per acre, when receiving 20 tons of manure annually 219 lbs. more, and 200 lbs. of sodium nitrate 201 lbs. more. The better grades of a given class or type of tobacco were found to contain a higher percentage of potassium than the poorer grades. The good leaf of a given grade usually contained about as much chlorine as the common of the same grade and sometimes more.

Return of crop residues did not appear to increase yields of crops in a rotation of corn, soy beans, wheat, and clover. The effect of variously applied manure in a rotation is also recorded.

Japan clover untreated produced 1,770 lbs. of hay, when receiving acid phosphate 2,304, limestone and acid phosphate 3,600, and rock phosphate 3,724 lbs. Further studies (E. S. R., 56, p. 132) on the effects of height and time of clipping sweet clover showed that for maximum growth during the second year the first year's crop if made into hay should be cut not earlier than late summer or early fall. Cutting in midsummer of the first year appeared to reduce the second-year growth by one-third. However, in a normal year the plants did not appear to be actually killed by any cutting the first year except indirectly through the heaving of weak root systems during the winter. During summers with abnormal rainfall some deaths may occur among plants that have been cut during midsummer. Bluegrass on a plat which had grown bluegrass with sweet clover the previous year yielded nearly three times as much as bluegrass following bluegrass alone.

[Field crops investigations in Mississippi, 1926], [J. F. O'KELLY], J. C. C. PRICE, C. F. BRISCOE, T. F. AKERS, E. B. FERRIS, C. T. AMES, and H. F. WALLACE (*Mississippi Sta. Rpt. 1926*, pp. 5-7, 13, 14, 21, 25-27, 28, 30, 31, 34, 35).—Further experiments (E. S. R., 55, p. 636) reported on from the station included breeding work with corn (E. S. R., 56, p. 530), cotton, and soy beans, fertilizer trials with cotton (E. S. R., 56, p. 736) and alfalfa, variety tests with corn, slip cutting trials with sweet potatoes, tests on the inoculation and sterilization of seed of legumes, and rotations. Fertilizer tests with cotton at the Delta Substation (E. S. R., 57, p. 229) and activities of the Holly Springs, South Mississippi, and Raymond Substations have been largely noted earlier (E. S. R., 56, p. 731).

Some evidence of crossing over was observed in F_1 material from a cross between a cotton variety with medium length and percentage of lint and one with long staple and low lint percentage. F_1 material from a cross between a fuzzless and lintless type and a type with excess fuzz and normal percentage showed complete dominance of the fuzzless and lint characters. The F_2 from a cross between long and short types appeared to segregate into one long, two medium, and one short. In the F_2 from crosses between wilt susceptible and wilt resistant types the plants lacking the factor for resistance appeared to be eliminated by the fungus. Fertilizer tests with cotton in the lime belt showed considerable profit from the use of acid phosphate and potash in addition to nitrogen.

An experiment was made to determine the loss caused in crop yield by cutting part or all of the sweet potato vines to obtain cuttings for further planting. Where all of the vines were cut that could be used for cuttings, leaving stubs about 6 in. long, an average loss of 49.9 per cent resulted; with three-fourths of the vines cut, leaving one-fourth of the long vines intact, 35 per cent loss; one-half of the vines removed 28.7 per cent loss; and where one-fourth of the vines were cut 20.2 per cent.

Fertilizer tests with alfalfa on black land showed a noticeable effect in growth and resistance to freezing to accompany phosphorus applications. Raw rock phosphate was the least effective of the phosphorus fertilizers, and sodium nitrate, potassium sulfate, and flowers of sulfur failed to show beneficial results.

[Field crops work at the Porto Rico Insular Station] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926*, Spanish ed., pp. 30-44, 50, 51, 55, 56).—Continued experimental activities (E. S. R., 56, p. 524) reported on embraced trials of varietles, seedlings, recent introductions, and resistant sorts; breeding

work; fertilizer trials; cultural, cutting, and handling tests, all with sugar cane; and varietal trials with cowpeas and forage grasses.

Bean culture, E. V. HARDENBURG (*New York: Macmillan Co.*, 1927, pp. XV+238, pl. 1, figs. 40).—Covering the practical phases of growing and handling different kinds of beans, this volume includes classifications and descriptions; outlines the field, cultural, harvesting, marketing, and utilization practices involved in general bean production; and discusses improvement and the characteristics and cultural needs of the several types.

Observations on subterranean clover, W. DAVIES (*Jour. Min. Agr. [Gl. Brit.], 34 (1927), No. 5, pp. 455-458*).—The behavior of *Trifolium subterraneum* in agronomic experiments and its insects and diseases are reviewed, and the results of seeding tests with the crop at Aberystwyth, Wales, are summarized.

Effect of different dates of planting corn on yields, C. K. McCLELLAND (*Arkansas Sta. Bul. 222 (1927), pp. 14, fig. 1*).—Experiments between 1917 and 1926 involving a number of corn varieties indicated April 15 as the best average planting date in northwest Arkansas and from June 1 to 15 in the vicinity of Scott. Optimum planting dates may be later than April 15 on bottom lands in the northwestern part of the State, and the findings at Scott may not apply to certain hill lands in central Arkansas. Seasonal conditions and varietal differences may also require modifications of the recommendations.

Varieties of cotton in northwest Texas, R. E. KAPPER and D. L. JONES (*Texas Sta. Bul. 364 (1927), pp. 59, figs. 8*).—This is a revision of Bulletin 299 (E. S. R., 48, p. 335) and brings the work forward to include 1926.

Early maturing varieties have consistently given the highest yields, Burnett and the medium to early strains of Mebane being outstanding. Lightning Express, Acala, and Durango, early sorts with somewhat longer staple, yield well and can be grown profitably if the producer receives a corresponding premium for the extra staple.

Considerable variation was observed in the fruiting habits of the different varieties, those bearing the most flowers also giving the largest yields. At 140 days after planting early sorts had 40 to 60 per cent. of their total crop open as compared with 20 to 25 per cent. for the large boll varieties. Lint percentages were quite constant from year to year, whereas lint length fluctuated rather widely during the different seasons. Correlations between the percentage and yield of lint suggested that varieties with a lint percentage above average also tend to exceed the average acre yield. A rather consistent high and negative correlation, r ranging from -0.37 ± 0.16 to -0.74 ± 0.08 , exists between the percentage and length of lint for the varieties grown during the period 1918-1925. A negative but not highly significant correlation was shown between long staple and yield of lint in 7 of these years. The best varieties, stapling from $1\frac{1}{8}$ to $1\frac{3}{8}$ in., averaged 79 per cent. as much lint as those having a staple of $\frac{7}{8}$ and 1 in.

A note on Danthonia, with particular reference to the effect of sulphuric acid on the germination of the seed, H. C. TRUMBLE (*Jour. Dept. Agr. So. Aust., 30 (1927), No. 12, pp. 1210-1213*).—Immersion of *D. pilosa* seed in concentrated sulfuric acid for five minutes caused the greater portion of the glumes to be removed, greatly facilitating handling and markedly stimulating germination under both laboratory and field conditions. The author points out the pasture value of *Danthonia* spp., the commonest and most widely distributed of native grasses in Australia.

Note on the losses in mangels during storage, G. T. PYNE ([*Irish Free State*] *Dept. Lands and Agr. Jour.*, 27 (1927), No. 1, pp. 33-35).—Experiments at Munster Institute Farm, Cork, showed that mangels lost about 27 per cent.

of their dry matter by the end of five months' (December 4 to May 3) storage, confirming an estimate derived previously from tests at the Albert College, Glasnevin, under rather different conditions. The loss thus appears to be independent of any change of weight and drying out in the roots caused by local conditions.

Correlation between yield and some prominent characters in *Andropogon sorghum*, G. L. KOTTUR and V. M. CHAVAN (*Poona Agr. Col. Mag.*, 19 (1927), No. 1, pp. 25-29, fig. 1).—High positive correlations between grain yield and plant height, number of leaves and especially length of rachis, weight of head, and breadth of head were observed in studies on four important varieties of sorghum. The correlations noted between grain yield and grain size were small but positive, and were small and negative in the short peduncle class and positive in the long peduncle class.

Sugar beet experiments [in Ireland], 1926 ([*Irish Free State*] *Dept. Lands and Agr. Jour.*, 27 (1927), No. 1, pp. 39-69).—In continued experiments at many centers in the Irish Free State (E. S. R., 56, p. 637), Dutch, German, Danish, and French sugar beet seed ranked in the order given in both yield and sugar content, although differences were not great. The time of applying farmyard manure for sugar beets—i. e., whether plowed in during winter or in drills just before seeding—did not appear to influence appreciably the shape of the roots or the crop value as determined by yield and sugar content. A dressing of superphosphate 4 cwt., kainit 4 cwt., and ammonium sulfate 1 cwt. per acre just before planting the seed gave returns quite as satisfactory as those from modifications of this dressing. Application of the phosphorus and potash salts in winter instead of in spring gave no apparent benefits. Top dressing with 1 cwt. of sodium nitrate per acre after singling increased the average yield by 5 cwt., but decreased the sugar content by 0.2 per cent, the increase in crop value barely sufficing to pay for the cost of the top dressing. Spacing experiments did not permit of definite conclusions.

A census of an acre of roots: The relation of regularity and density of plants to yield per acre, J. HUNTER-SMITH and H. R. WILLIAMS (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 5, pp. 448-455).—Observations at the Herts Institute of Agriculture on stands of sugar beets before and after singling gave indications that the average weight per beet decreases and the number of beets per acre increases as the interplant spacing diminishes. The closer spacing gave the higher yields, and analyses showed that the smaller roots had the greater sugar percentages. Similar investigation with mangels and marrow-stem kale also indicated the desirability of a full regular population of plants at suitable spacing intervals. See also a previous note by Engledow (E. S. R., 56, p. 227).

Conservation of early-cut cane stubble, W. E. CROSS (*Facts About Sugar*, 22 (1927), No. 27, pp. 654).—Experiments in Tucuman confirmed earlier work of A. H. Rosenfeld demonstrating the advantage of drawing soil to the early cut sugar cane. The benefits to succeeding crops were evident in the higher average yields obtained.

Vetch, C. T. AMES (*Mississippi Sta. Circ.* 74 (1927), pp. 6).—Cultural and field practices and harvesting and utilization methods are outlined for growing vetch.

The best varieties of spring wheat [trans. title], V. V. TALANOV [TALANOFF] (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant Breeding)*, 1926, Sup. 29, pp. VIII+231, pls. 27; *Eng. abs.*, pp. 201-227).—A detailed report is rendered of varietal trials carried on with 12 sorts pertaining to *Triticum vulgare* and 10 to *T. durum* at numerous experiment stations in the Union of Socialist

Soviet Republics during 1924 and 1925. The data and discussion deal with the comparative yields, agronomic characters, incidence of insects and diseases, drought resistance, technical values, chemical composition, and milling and baking qualities of the varieties tested. Agronomic and chemical data are given for the several varieties in the 44 bilingual tables appended.

Garnet wheat, L. H. NEWMAN and A. G. O. WHITESIDE (*Canada Dept. Agr. Bul. 83, n. ser. (1927), pp. 76, pls. 4, fig. 1*).—The behavior of Garnet wheat (E. S. R., 54, p. 833) in comparative field trials at experimental institutions in Manitoba, Alberta, and Saskatchewan and in milling and baking trials in Canada and Minnesota is reported on, with a description and history of the variety.

Garnet is an early maturing, beardless variety of hard red spring wheat developed from a cross made in 1905 at Ottawa between the varieties Preston A and Riga M. It is quite closely related to Ruby wheat, which variety it resembles somewhat, but test results showed that it outyielded Ruby quite definitely, matures about 1 day ahead, and its straw is slightly stronger. It did not display resistance to any of 7 physiologic forms of stem rust.

Compared with Marquis, Garnet did not differ much in average weight per bushel; has normally a smaller and more linear shaped kernel; a lower weight per 1,000 kernels; a more vitreous kernel, which holds its color better under moist conditions; a somewhat weaker straw; about equal flour yields when the bushel weights are similar; an appreciably higher ash content in most tests; and a somewhat lower crude protein content. It did not differ significantly from Marquis in yielding ability, but it may surpass the latter in specific districts, notably where an early sort has a distinct advantage, as it matures from 5 to 10 days earlier than Marquis. Unbleached flour of Garnet when freshly milled is described as light yellow or creamy yellow, and that of Marquis creamy white. Garnet flour has been satisfactorily bleached by two types of commercial bleaching and maturing agents. It generally absorbs slightly less water than Marquis and tends to produce a somewhat lower bread yield. Its dough is less resilient and elastic, but is considered more pliable in consistency and resisted fermentation better than that of Marquis. In most tests Garnet produced a slightly larger loaf than Marquis, nearly equaled it in texture of crumb, but ranked appreciably lower in crumb color.

Protein survey of the North Dakota wheat crops of 1925 and 1926, C. E. MANGELS, T. E. STOA, and W. GUY (*North Dakota Sta. Bul. 208 (1927), pp. 14, figs. 5*).—According to analyses of samples collected by county agents in their respective counties, hard spring wheat averaged 58.8 lbs. per bushel and 12.3 per cent of protein (507 samples) in 1925 and 59.1 lbs. and 14.23 per cent (407 samples) in 1926 as compared to 60.9 lbs. and 11.33 per cent in 1924. Durum wheats averaged 61.3 lbs. and 14.08 per cent in 1926.

Climatic conditions prevailing during the growing seasons of 1925 and 1926 were less favorable to wheat production than the very cool season of 1924, largely because of subnormal rainfall in some sections. Comparative data show that when produced under similar conditions durums will average distinctly higher in test weight than bread wheats, and the protein content of durums will average about the same as hard spring or bread wheat types. Factors responsible for variation in protein content have been treated more fully elsewhere (E. S. R., 53, p. 838). Variations in protein premiums and their relation to wheat prices are discussed briefly.

Heat-damaged wheat, D. A. COLEMAN and B. E. ROTHGEB (*U. S. Dept. Agr., Tech. Bul. 6 (1927), pp. 32, figs. 8*).—The results of physical, chemical, milling, and baking tests made on samples of wheat discolored by the heat of fermentation are reported in comparison with similar data from tests on sound wheat.

Wheat discolored to the shade termed "skin-burned" was found to be of inferior milling quality, particularly if such wheat appears in country shipments before they have been mixed at an elevator. With even less than 0.5 per cent of skin-burned kernels in country-run wheat, there seemed to be fair evidence that the milling and baking quality of the whole lot is distinctly injured. Other tests on this country-run wheat showed that the so-called sound wheat containing the heat-damaged kernels is not sound, i. e., is in a sick or weakened condition. The character and quantity of heat-damaged kernels in a sample may indicate the extent to which sound wheat has been injured. One per cent of slightly skin-burned wheat or 0.5 per cent of badly heat-damaged kernels when mixed with sound wheat was found to injure the milling and baking quality of the latter.

Stack-stained or header-damaged wheat, a distinct type of heat-damaged grain, is occasioned by cutting and stacking moist, immature wheat. This discoloration is often aided by the presence of large quantities of moist green weeds mixed with the stacked grain. Badly stack-stained wheat is of inferior milling quality, usually giving a low yield of flour which is high in ash. Bread made of such flour has poor color, a bitter flavor, and an undesirable weedy odor. The inferiority of the resulting flour and bread increases with the severity of the discoloration of kernels. Stack-stained wheat is apparently not as seriously injured as bin-burned wheat of the same color. Neither this wheat nor flour milled therefrom store well. Condition of the grain at time of stacking or bin storage seems more responsible for heat-damaged kernels than are the harvesting or threshing methods.

Means for avoiding heat damage to wheat are outlined briefly, and the construction of a ventilated wheat bin is detailed.

Cleaning grain on farms and in country elevators, R. H. BLACK and E. G. BOERNER (*U. S. Dept. Agr., Farmers' Bul. 1542 (1927), pp. 11+27, figs. 19*).—This bulletin supersedes Farmers' Bulletin 1287 entitled Foreign Material in Spring Wheat (*E. S. R., 48, p. 441*).

Proceedings of the seventeenth annual meeting of the Association of Official Seed Analysts of North America (*Assoc. Off. Seed Anal. North Amer. Proc., 17 (1924-25), pp. 52, figs. 11*).—The activities of the association during 1924 are reported on with the following papers presented at the seventeenth annual meeting at Washington, D. C., from December 31, 1924, to January 2, 1925:

Agricultural Seeds—When and Where to Buy, by E. Brown (p. 13); Occurrence of Seeds of Sudan Grass-Sorghum Hybrids, by E. F. Sirrine (pp. 14, 15); Comparative Studies of Alfalfa Seeds of Different Shapes, by S. C. Miller (p. 14); Test Gardens as Aid to Seed Standardization, by H. L. Bolley (pp. 16-18); Distinguishing Characteristics of the Seeds of Certain Species of Brassica, by F. H. Hillman (p. 19); Color and Weight of Red Clover Seed as Indications of Origin, by H. H. Henry (pp. 19-27); Seed Testing for International Trade with Canada, by F. T. Wahlen (pp. 27, 28); Variations in Analyses of Orchard Grass Seed—Referee's Sample, by O. A. Stevens (pp. 28-31); Effect of Light and Potassium Nitrate on Germination, by E. H. Toole and W. L. Goss (p. 31); Germination of Hard Seeds in Alfalfa and Sweet Clover as the Season Advances (pp. 31, 32) and Interpretation of the Seed Value of Newly Threshed Winter Wheat (pp. 41-43), both by W. O. Whitcomb; Some Notes on the Behavior of Broken Seeds of Cereals and Sorghums, by A. M. Lute (pp. 33-35); Notes on the Germination of Broken Seeds, by W. O. Whitcomb and W. D. Hay (pp. 38, 39); Variations in Germination Tests of Vegetable Seeds, by W. L. Goss (pp. 40, 41); and A Provisional Seeding Value Index for Field Seeds, by F. S. Holmes (pp. 43, 44).

Hard coated seeds and their vitality, G. B. PATWARDHAN (*Poona Agr. Col. Mag.*, 19 (1927), No. 1, pp. 5-7).—Germination tests of seed of *Phaseolus mungo* and *P. radiatus* during the year after harvest showed a consistent and continuous reduction in the hard seed content and similarly an increase in germination up to the next planting time. Germination seemed best after a rest period of eight or nine months, with a reduction of germination and vitality after further storage.

Poison ivy, J. G. FISKE (*New Jersey Stat. Circ.* 206 (1927), pp. 8, figs. 3).—The weed is described, and methods for its extermination by cultivation and chemicals and treatments for ivy poisoning are suggested.

The puncture vine: A serious weed in Colorado, L. W. DURRELL and A. M. LUTE (*Colo. Agr. Col. Ext. Circ.* 46 (1926), pp. 4, figs. 2).—*Tribulus terrestris* is described, with suggested control methods.

HORTICULTURE

Tendencies in American horticulture, C. G. WOODBURY (*Mich. State Hort. Soc. Ann. Rpt.*, 56 (1926), pp. 53-70).—A comprehensive address given at the dedication of the horticultural building, Michigan State College, February 4, 1926, and covering the fields of teaching, research, and practical horticulture.

Makers of horticulture, F. C. BRADFORD (*Mich. State Hort. Soc. Ann. Rpt.*, 56 (1926), pp. 27-36).—Brief comments are made upon the lives and the work of some of the early leaders in the art and science of horticulture.

Plant hunting, E. H. WILSON (*Boston: Stratford Co.*, 1927, vols. 1, pp. XXIX+248, pls. 63; 2, pp. IX+276, pls. 65).—Illustrated mostly from photographs taken by the author, who from 1899 to 1922 traveled in many lands in search of plants, this text describes the countries visited and the characteristic vegetation of each, and discusses in a popular way the discovery of the lands and the early visits of plant explorers.

[**Horticultural investigations at the Kentucky Station**] (*Kentucky Sta. Rpt.* 1926, pt. 1, pp. 18, 19).—Conforming to the results of preceding years (*E. S. R.*, 56, p. 141), lightly pruned apple trees continued to outyield those heavily pruned. Concerning the relative merits for planting of different sized peach trees, it was found that medium sized No. 1 trees made better growth than oversized trees. The latter when heavily branched did not make a uniform top growth when pruned back to a whip, suffering apparently from the removal of the strong, vigorous buds. Small, healthy trees, 2 to 3 ft. tall, were practically equal on fertile soil to medium sized trees.

A study of the effect of the soil reaction on tomatoes, though incomplete, has shown that tomatoes growing in mixed peat and sand of pH 6.3 were neither benefited nor injured by the addition of lime. Sulfate of ammonia was as beneficial as nitrate of soda, and the time of ripening was not affected by either acid phosphate or potassium sulfate. Based on moisture contents of 94.73, 93.93, and 94.03 for tomatoes grown on plants in soils (1) deficient in phosphorus, (2) deficient in potash, and (3) completely fertilized, respectively, it is concluded that neither phosphorus nor potash materially influenced the proportion of dry matter in the fruits.

[**Horticultural work by the Mississippi Station**], J. C. C. PRICE and H. F. WALLACE (*Mississippi Sta. Rpt.* 1926, pp. 12, 13, 14, 36, 37).—In variety tests the Red Astrachan apple proved extremely susceptible to drought injury. The Lucy Bunn peach, originated at West Point, Miss., was found promising on account of the late blooming, large size, and excellent quality of the fruit.

As suggested in the preceding report (*E. S. R.*, 55, p. 642), June bud peach trees were much more satisfactory for planting than were 1-year-old trees.

Among 10 grades of June buds, the 12- to 18- and the 18- to 24-in. lots proved most satisfactory, and have the added advantage that they may be headed at any desired height. Transplanting losses were lower with the June bud trees, and in respect to productivity the June buds were also decidedly superior.

Of various northern grapes, the Delaware proved most satisfactory. Among raspberries, the Cardinal (red) and the Cumberland (black) proved best, and the Young dewberry was also esteemed on account of heavy production. The Missionary strawberry proved satisfactory on account of its resistance to drought and fine quality. Blueberries were propagated readily by root cuttings of 1- to 3-year-old wood.

In studies at the Raymond Substation, a ton of 10-3-3 fertilizer gave the highest yields of tomatoes over a 2-year period. Topping at the fourth cluster and staking appeared to increase the size of tomatoes. Nitrogen in equal weight from nitrate of soda, sulfate of ammonia, and cottonseed meal gave excellent results. Marvel and Marglobe proved to be valuable tomatoes on account of wilt resistance. Using an 8-4-3 mixture with nitrogen from sulfate of ammonia, 1,000 lbs. proved more effective for snap beans than did 1,500 lbs. With garden peas nitrate of soda proved the most satisfactory source of nitrogen.

The importance of proper pollination in fruit yields, E. C. AUCHTER (*Mich. State Hort. Soc. Ann. Rpt.*, 56 (1926), pp. 15-26).—An exhaustive review of the present knowledge of fruit pollination, with special reference to results secured at the Maryland Experiment Station.

Self and cross-sterility in fruit trees: A summary of results obtained from pollination experiments with plums, cherries, and apples, M. B. CRANE (*Jour. Pomol. and Hort. Sci.*, 6 (1927), No. 2, pp. 157-161+[5], pls. 4, figs. 2).—A summary of results obtained during the period 1911-1925 at the John Innes Horticultural Institution, England, in pollination experiments with plums, cherries, and apples. The compatibility between various cherry varieties and between plums is clearly shown by photographic illustrations and by charts. Considerable of the earlier data has been previously noted (E. S. R., 49, p. 234).

Studies in the physiology of fruit trees.—I, The seasonal starch content and cambial activity in one- to five-year-old apple branches, T. SWARBRICK (*Jour. Pomol. and Hort. Sci.*, 6 (1927), No. 2, pp. 137-156, pls. 6).—Data taken upon the seasonal changes in starch content in 1- to 5-year-old branches of apple and pear trees showed a marked disappearance of starch from the cortex and phloem in January and early February, with a reappearance in late February. In May starch completely disappeared from all tissues of 1- to 4-year-old branches. The disappearance was about 3 weeks later in the 4- than in the 1-year branches. Starch began to reappear in small amounts in the cortical and xylem tissues in mid-June. With a slowing down of elongation starch accumulation began in the apical regions of all shoots and worked downward.

Cambial activity was indicated by the cambium becoming swollen and translucent subsequent to bud swelling in the spring. The initiation of xylem formation was in the apical region and worked downward, there being as much as 3 weeks difference between the 1- and the 4-year-old branches. In 1-year shoots cambial activity ceased about the same time that elongation ceased, but in 4-year branches continued for a month later. Cessation of cambial activity was preceded by a gradual enlarging of the meristem cells. In vegetative shoots cambial activity was early and starch disappearance lagged, with the reverse situation in the flowering shoots.

Does it pay to prune apple trees for quality production? R. E. MARSHALL (*Mich. State Hort. Soc. Ann. Rpt.*, 56 (1926), pp. 5-13).—In studies conducted by the Michigan Experiment Station in a commercial orchard near Eaton Rapids the systematic thinning out of the smaller branches in the spring of 1925 resulted in decreased total yields in those trees fertilized with nitrogen since 1920. On the other hand, in unfertilized and straw mulched trees pruning gave an apparent increase in yield, and in all three instances resulted in an increase in both the percentage of large apples and the yield of apples larger than 2.5 in. in diameter.

The average net annual returns per tree receiving nitrogen were approximately 3.5 times as great as for unfertilized trees. Little, if any, difference in yields was noted whether nitrogen was obtained from nitrate of soda or ammonium sulfate or whether applied shortly before blossoming or early in September. Straw mulch was apparently beneficial. In conclusion the author suggests that while applications of nitrogen were much more effective than pruning in increasing yields and the size of fruits, moderate thinning of mature apple trees every 2 or 3 years is still to be recommended.

The influence of ammonium sulphate as a direct source of nitrogen for apple trees. M. B. DAVIS (*Sci. Agr.*, 8 (1927), No. 1, pp. 41-55, figs. 3).—Experiments with 2-year-old Melba apple trees, planted in pots of freshly ground sandstone and supplied with nutrient solutions the nitrogen of which was obtained from various sources, failed to show that the nitrogen of ammonium sulfate is directly available to the apple tree. The trees in the ammonium sulfate series were somewhat slower in starting growth than were those in the nitrate of soda, no nitrogen, and check series, and in fact exhibited no superiority to the checks or no nitrogen trees until late June. Incidentally, determinations by A. G. Lochhead et al. failed to show any trace of nitrites in the ammonium sulfate series until after June 10.

Computations upon the total growth for the first season gave averages of 72.34 ± 6 , 51.31 ± 4 , 51.25 ± 4.47 , and 44.23 ± 6.3 in. for the nitrate of soda, ammonium sulfate, no nitrogen, and check trees. The odds (Love and Brunson method) in favor of nitrate of soda over ammonium sulfate were 9,999 to 1. Weights of the root systems at the end of the first growing season were 303.7, 329, 375.5, and 565.5 gm., respectively, for check, no nitrogen, ammonium sulfate, and nitrate of soda trees.

Observations on the growth of the trees in their second season showed very little difference between the nitrate of soda and the ammonium sulfate series, indicating that the ammonium sulfate had become fully available. In a second experiment in which cyanamide was included, nitrate of soda was again significantly superior, the odds computed from measurements of the new top growth being 4,999 to 1 in favor of nitrate of soda over ammonium sulfate. All three nitrogen carriers proved toxic in the amounts used, the cyanamide the most and the nitrate of soda the least. In conclusion the author states that no indication was found that apple trees are able to use ammonia as a direct source of nitrogen, and in fact it was apparent that ammonium sulfate was temporarily toxic under the conditions of the experiment.

Studies in orchard management with special reference to cherry production. A. J. ROGERS, JR. (*Michigan Sta. Spec. Bul.* 166 (1927), pp. 43, figs. 4).—Records taken by the owner of a well-managed cherry orchard in Benzie County showed clearly the heavy cost of bringing cherry orchards to a productive age and of maintaining the orchards in a profitable condition. Assuming the original cost of the land to have been \$100 per acre and 9 years to have been the time required for the trees to reach a productive condition, an

average investment of over \$900 was required. Subtracting from this some \$200 for intercrops and partial cherry crops, the average net investment at 9 years was over \$700 per acre.

The one factor that stood out above all others in determining the success or failure was high average yields. Yields in turn were determined by several other factors, including the location of the orchard, the natural fertility of the soil, the kind of spraying, pruning, and fertilizing practiced, the planting distances, and above all the varieties. Montmorency stood preeminently above all other varieties, both sweet and sour, as a profitable kind. Differences in investment costs per acre over the first 9 years varied from \$551.57 for one block of Montmorency to \$854.28 for a block of sweet cherries. English Morello gave satisfactory results. Early Richmond and Louis Phillipe are not recommended for extended planting. Among sweet varieties, Windsor, Schmidt, and Bing gave fair results, and Lambert failed, largely on account of a tendency of the fruit to crack. The Duke varieties proved only fair. Among measures advised in cherry production are comparatively close planting, light annual pruning, and the liberal use of nitrogen-carrying fertilizers.

Pollen sterility in peaches, C. H. CONNORS (*Science*, 66 (1927), No. 1710, p. 332).—Data obtained in 1926 upon peach seedlings resulting from four controlled crosses in which J. H. Hale was the ovule parent showed considerable pollen sterility (49.2 and 33 per cent) in two of the lots, and none in the others in which seedlings, half of Slappey parentage, were used as pollen parents.

[Fruit variety tests in Porto Rico] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926, Spanish ed.*, pp. 47, 48).—This comprises brief notes upon variety tests with the avocado, mango, lemon, grape, pineapple, and Rubus.

Three years' experience with incubator tests to determine the keeping qualities of cranberries, N. E. STEVENS (*Wis. State Cranberry Growers' Assoc. [Proc.]*, 40 (1926), pp. 8-12).—The results of preliminary investigations with cranberries placed in an electric incubator held at a uniform temperature of 32° C. (89.6° F.) indicate that the behavior of the berries in this environment may be taken as a fair key to their behavior in ordinary storage; for instance, a comparison in 1924 of incubator tests with actual keeping tests upon two lots of the Middleboro variety, one dusted and one untreated, showed 0 and 4.9 per cent rot in the incubator and 7 and 33 per cent in storage, respectively. Similar results were obtained in 1925.

Studies in the root and shoot development of the strawberry, II-IV (*Jour. Pomol. and Hort. Sci.*, 6 (1927), No. 2, pp. 81-112, pls. 8).—These papers continue the work previously noted (E. S. R., 56, p. 44).

II. Normal development in the second year, C. E. T. Mann and E. Ball (pp. 81-86).—Herein are presented observations on the second year's growth of strawberry plants. The consistency with which the march of growth during the second year followed that of the first is deemed remarkable. The slight modifications were accounted for by seasonal differences.

III. The influence of time of planting on the development of the strawberry, with a consideration of the possible influence of soil and locality, E. Ball and C. E. T. Mann.—Observations upon the development of Royal Sovereign strawberry plants set out in August, September, October, December, and March again emphasized the importance of setting plants as early as possible after their formation. Those set in late October were not superior to plants set the following spring, both being unable to carry a crop of fruit. Root formation was greatest in the plants set in August. Apparently the sooner a runner was reset after it reached a stage of independence the better were the results. Competition with the old plants and other runners and the greater injury suffered

in transplanting had deleterious effects on plants allowed to remain for some time in the old bed. In some cases August plants became sufficiently well established to continue crown growth. From a practical standpoint early set plants were more profitable on account of much larger fruiting.

Observations on Royal Sovereign plants set in a commercial field near Norwich where the rainfall was less and the soil lighter than at Long Ashton showed the same general sequence in the march of growth as at Long Ashton, but the autumn growth of roots was greater.

IV. *The influence of some cultural practices on the normal development of the strawberry plant*, E. Ball and C. E. T. Mann (pp. 104-112).—Strawberry plants set so that the crown was completely covered with soil suffered root injury but were not permanently damaged. Shallow planting was more injurious, some of the new roots failing to reach the soil, and as a result the plants were permanently weakened. Trimming roots did not affect the ultimate vigor of the plants. Hilling the plants lightly in August gave favorable results in increased vigor; conversely, drawing the soil away had a deleterious effect. Severing the main crown resulted in an abnormal growth caused apparently by the formation of many weak adventitious crowns. Injury to the root system decreased the size of the leaves and the general vigor. The water logging of plants during spring and summer resulted in low vigor and in small leaves which died prematurely. The small leaf condition found in strawberries may be attributed to various forms of injury. Studies of the depth to which strawberry roots penetrate showed 90.06 per cent of the total root system to be in the upper 6 in. of soil; in fact, 73.11 per cent were in the first 3 in.

Tulip culture, H. M. BIEKART (*New Jersey Stas. Circ. 205 (1927)*, pp. 28, figs. 6).—A general discussion upon types and varieties, culture, forcing, the control of insect and other enemies, and the occurrence of color mutations.

FORESTRY

Forest planting in Michigan, A. K. CHITTENDEN (*Michigan Sta. Spec. Bul. 163 (1927)*, pp. 24, figs. 6).—Among the subjects discussed in this paper are the raising of trees from seed, field planting operations, soil requirements for forest trees, principal characteristics of various timber species, the growth of various species in plantations, and the development of windbreaks.

Timber growing and logging practice in the central hardwood region, C. R. TILLOTSON (*U. S. Dept. Agr. Bul. 1491 (1927)*, pp. 39, pls. 6, fig. 1).—With a foreword by W. B. Greeley upon the necessity of utilizing the forests and forest lands to the best advantage now that the great original resources are becoming depleted, this paper discusses the present status of forestry in the area concerned and outlines the best methods of forest management in order to keep the forests productive, both from the viewpoint of the small landowner and from that of the professional forester. The need for preventing forest fires, for favorable tax laws, and for planting additional lands with productive species is stressed.

Timber growing and logging practice in the Douglas fir region, T. T. MUNGER (*U. S. Dept. Agr. Bul. 1493 (1927)*, pp. 42, pls. 8).—With an introduction by W. B. Greeley, this paper discusses the present status of forestry in the Douglas fir region of the Pacific Northwest, outlining those measures and practices which will conserve as much as possible the timber resources but at the same time allow for rational utilization. Fire prevention, reproduction, afforestation, slash disposal, and grazing control are among subjects discussed.

The growth of the wood of ash (*Fraxinus excelsior* L. and *F. oxycarpa* Willd.) and Douglas fir (*Pseudotsuga douglasii* Carr.), L. CHALK (*Quart. Jour. Forestry*, 21 (1927), No. 2, pp. 102-122, pls. 2, figs. 5).—As determined at the Imperial Forestry Institute, Oxford, England, by microscopic examination of pieces of wood removed at frequent intervals, growth in the Douglas fir started in the upper parts of the stem from 10 to 14 days earlier than in the lower portion, but there was no appreciable difference between the north and south sides of the trunk. Although growth started sooner in open-grown trees, little progress was made in the period preceding the start of the close-grown trees. Growth in the stem preceded the swelling of the leaf buds by approximately 12 days. Slowing down of growth was observed in the Douglas fir coincident with the cessation of the spring wood formation, and growth ceased altogether by the middle of September.

In the ash no difference in time of starting was noted between the upper and the lower parts of the stem, but there was a distinct tendency for the south side to begin growing before the north. All parts of the stem began to grow 1 week before the flower buds burst, and growth ceased altogether by the middle of August. No slowing down was observed in the ash. Compared with Douglas fir, growth in the ash was farther advanced throughout the season. The rate was higher in June and July and fell off more abruptly at the end of the season.

Annual investigative report for 1926 and program for 1927, Appalachian Forest Experiment Station (U. S. Dept. Agr., Forest Serv., 1927, pp. [2]+21).—A brief report prepared in mimeographed form and containing brief comments on progress to date and upon projected activities.

Lake States Forest Experiment Station report to the advisory committee for 1926 (U. S. Dept. Agr., Forest Serv., [1927], pp. [2]+35, pl. 1).—This progress report, prepared in mimeograph form, outlines briefly the present accomplishments, the needs, and the future plans for activities.

DISEASES OF PLANTS

The literature of plant pathology and the Plant Industry Catalog, N. E. STEVENS (*Phytopathology*, 15 (1925), No. 11, pp. 722-724).—This is a briefly historical and descriptive account.

Some notes on diseases new to Ontario, J. E. HOWITT (*Phytopathology*, 15 (1925), No. 5, p. 300).—Plant diseases noted in the summer of 1924 for the first time in Ontario included rose canker (*Coniothyrium uerudorffiae* (C. fuckelii?)), elm twig canker (*Gnomonia ulmea* ?), celery yellows (*Fusarium* sp.), and lettuce anthracnose (*Marssonina panattoniana*).

Report of provincial plant pathologist, Vancouver, J. W. EASTHAM (*Brit. Columbia Dept. Agr. Ann. Rpt.*, 20 (1925), pp. 30-33).—This account covers fruit tree winter injury, apple tree spraying experiments, and potato troubles (seed rotting and mosaic).

The transmissible lytic principle (bacteriophage) in relation to plant pathogenes, G. H. COONS and J. E. KOTILA (*Phytopathology*, 15 (1925), No. 7, pp. 357-370, pls. 4).—The authors give a review of earlier work related to the activities of a bacteriophage, for which the noncommittal term "transmissible lytic principle" is preferred by them, also of their own related experimentation, in which the d'Herelle phenomenon (E. S. R., 48, p. 675) was demonstrated with various plant pathogenes. This so-called principle was obtained from rotted carrot, from soil, and from river water, and it was found to be effective in very high dilutions, causing in various bacteria inhibition of growth and in

stronger concentration definite lysis. The principal organisms used were *Bacillus carotovorus*, *B. atrosepticus*, and *Bacterium tumefaciens*.

The potency of the filtrates was increased after a number of passages through a susceptible organism. The lytic principle after eight passages was more effective than was the same material after four passages, producing lysis in dilutions as high as 1:100,000,000. The lytic effects varied from day to day, especially in tubes of the less active principle and in high dilutions. Cultures, after addition of the lytic principle, showed loss of motility, malformation, and agglutination. Some evidence is offered to support the view that the lytic principle is made up of corpuscles which increase in number upon incubation with a susceptible organism. Agglutination appears early in this process. The activity of the principle is greatest at the temperatures most favorable for the growth of the susceptible organism. The temperature of the tests ranged from 7.8 to 36.1° C., but was usually 25°. The lytic principle was polyvalent toward *B. tumefaciens*, *Bacillus carotovorus*, and *B. atrosepticus*, slightly active against *B. amylovorus* and *B. typhosus*, and not active against *B. dysenteriae*, *Bacterium pullorum*, and *B. sanguinarium*. Its activity varied with strains of the organism. The potency of the filtrate was lessened after storage in a sealed flask for 5.5 months. It is believed that lytic principles occur widely in nature, and it is suggested that they control bacterial multiplication in the soil.

When the lytic principle was spread upon slices from the susceptible plants (carrot, potato), infection by *Bacillus carotovorus* and *B. atrosepticus*, respectively, was prevented. It is thought this protective action may be of importance in infection phenomena as well as in disease control.

Toxicity for plants of media used by pathogenic fungi [trans. title], C. R. HURSH (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 2, pp. 137-141).—Comparing his own observations with related findings by Fahmy (*E. S. R.*, 54, p. 745), Goss (*E. S. R.*, 51, p. 752), and Picado (*E. S. R.*, 52, p. 746), the author concludes that in certain, but not all, cases too much importance may have been attached to the wilting of plants under the action of filtrates of pathogenic fungi.

The so-called strands and secondary tumors in the crown gall disease, M. LEVINE (*Phytopathology*, 15 (1925), No. 8, pp. 435-451, pls. 4).—It is claimed, on the basis of former (*E. S. R.*, 42, p. 841) and recent studies, that the so-called secondary tumors and strands in crown gall are formed only in very young stems and petioles, and that they result from the growth and elongation of the immature tissues, the young infected tissues keeping pace for a time with the elongation and development of the inoculated organ. They begin to form simultaneously with the globular crown galls at the seat of the inoculation, and they depend upon the development of the organ for their elongation. Permeation metastases in human cancer occur through lymph channels of mature structures.

Studies on the mosaic disease of *Nicotiana glutinosa*, M. N. WALKER (*Phytopathology*, 15 (1925), No. 9, pp. 543-547, pl. 1).—It is stated that the species called by Allard (*E. S. R.*, 36, p. 451) *N. viscosum* should be called *N. glutinosa*. The mosaic diseases on *N. glutinosa* and on tobacco are transmissible both ways. Tomatoes are susceptible to the mosaic disease on *N. glutinosa*, which may be infected also with the mosaic on *Physalis pubescens*.

South African Ustilaginales [trans. title], L. VERWOERD (*Ann. Univ. Stellenbosch*, 4 (1926), A, No. 2, pp. 34, pls. 6, figs. 2; *Eng. abs.*, pp. 33, 34).—Dealing with the South African Ustilaginales, the author gives descriptions of 30 species under 9 genera. A host list with associated fungi includes about 25 genera, represented by 31 species named, besides at least 10 species which are not specifically named.

Quantitative determination of sulfur fungicides on foliage, H. W. FITCH (*Phytopathology*, 15 (1925), No. 6, pp. 351-354).—As a result of a comparison of the data obtained from tests (including fruit or leaves of apple, peach, cherry, plum, prune, quince, currant, gooseberry, and rose), as indicated for the seasons of 1922, 1923, and 1924 and as tabulated for apple foliage, the author holds that, while the amount of sulfur necessary for practice will vary with complex factors, not less than 30 to 40 mg. of sulfur dust should be applied on 40 leaves presenting a total area of 186.7 sq. in. to afford fair protection (90 per cent or more of scab-free fruit). This minimum should not be expected to remain for more than three weeks, or two weeks during critical periods or threatening weather. The time intervals allowable between dustings do not differ significantly from those between sprayings.

The inheritance of disease resistance in wheat and oats, E. F. GAINES (*Phytopathology*, 15 (1925), No. 6, pp. 341-349).—Some details are given of work done since the initiation in 1914 of this experimentation, results from some phases of which (E. S. R., 44, p. 843; 49, p. 244) are cited in this article. Though additional work is necessary before definite recommendations regarding elimination of seed treatment in commercial practice can be regarded as safe, immune wheats are claimed to be more prepotent in transmitting resistance than are those showing a slight infection. Similarly, the principle of resistance heritability in oats is considered as established.

A mosaic on winter wheat and winter rye, H. H. MCKINNEY (*Phytopathology*, 15 (1925), No. 8, pp. 495, 496).—This wheat disease has been reported and discussed elsewhere (E. S. R., 54, p. 146), but not until recently was the trouble definitely known to be a transmissible mosaic. Mosaiced rye cell inclusions resemble those associated with wheat mosaic. Soil infection persists from year to year. Varietal effects are noted. Winter wheat varieties bred pure for agronomic and botanical characters may differ widely in susceptibility to dwarfing (rosette) and as to ability to produce certain types of mosaic mottling. Preliminary results from head selection studies suggest that types of mosaic may be determined in part by inheritable factors which are not necessarily homozygous in a so-called pure line variety.

Observation and experimentation on cereal rusts [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 2, pp. 124-128).—Three general reasons are outlined as supporting the view that cereal rusts are seed borne.

Seed treatment for wheat, barley, and oat smuts, C. D. SHERBAKOFF (*Tennessee Sta. Circ.* 16 (1927), pp. 2).—The hot water treatment for the prevention of loose smut of wheat is described. This treatment is said to be effective also for covered smut, but treatment with copper carbonate, 3 oz. per bushel, is recommended. For the control of barley and oat smuts the formaldehyde treatment is described.

New seed disinfectants for the control of bunt of wheat and the smuts of oats and barley, W. H. TISDALE, J. W. TAYLOR, R. W. LEUKEL, and M. A. GRIFFITHS (*Phytopathology*, 15 (1925), No. 11, pp. 651-676, pls. 4).—In preliminary experimentation with several of the newer seed disinfectants as outlined, copper carbonate was the most satisfactory for control of wheat bunt. The organic mercury compounds gave promising results in oat smut control but not better than formaldehyde so far as tested, though as regards barley smut control they appeared to be the most satisfactory fungicides tested.

Oat blast, C. ELLIOTT (*Phytopathology*, 15 (1925), No. 9, pp. 564-567).—The results of work previously noted (E. S. R., 47, p. 45) having indicated that environmental conditions may be important in the production of oat blast, preliminary correlation studies (countings) were made during three years,

the results of which are shown in comparative tabulated form and are considered to throw some light on oat blast infection studies.

Varietal infection percentage differences in the amount of blast appear to be fairly constant from season to season. The varieties Hatchett, Kanota, Fulghum, Hutcheson Selection, and an unnamed black strain (C. I. No. 691) showed the lowest percentages of smut during the period; Culberson and Dwarf Culberson showed intermediate percentages; and Ferguson Navarro, Lee, and Custis showed consistently high percentages of blast. Percentages of blast in all varieties vary from year to year, all percentages being higher in some seasons and consistently lower in others. The varieties showing high blast percentages are known or suspected to be of hybrid origin. Known general facts regarding sterility following certain crosses in both animals and plants may have some bearing on the high percentages of undeveloped spikelets in the hybrid varieties Lee and Custis and also in Ferguson Navarro.

Oat smut infection in relation to size of grain, J. G. COULSON and E. A. LONS (*Phytopathology*, 15 (1925), No. 5, pp. 302, 303).—Preliminary experiments at Macdonald College during 1924, as here tabulated with brief description, are considered to indicate that, at least in case of dehusked oat seeds, higher percentages of oat smut (*Ustilago avenae* and *U. levis*) infection result from use of small than of large kernels.

Stem rust in Nebraska, G. L. PELTIER and A. F. THIEL (*Nebraska Sta. Research Bul.* 42 (1927), pp. 40, figs. 13).—A report is given of a study of sources of infection of stem rusts in Nebraska and of the physiologic forms of *Puccinia graminis* found within the State.

It is claimed that the urediniospores of stem rust do not overwinter in Nebraska. Barberries were found rusted at one time or another throughout the State, the degree of infection varying from year to year, depending on the weather conditions influencing the viability of the teliospores and the maturation of the barberry leaves at the time sporidia were infectious. During normal seasons pycnia appeared on the barberry between April 20 and April 26. Aecia with mature spores were found between May 6 and May 10, and uredinia on grasses and grains near infected barberries were collected about May 20 to May 25. *P. graminis tritici* and *P. graminis secalis* were the most common forms observed spreading from infected barberries. No clear evidence was found to indicate that *P. graminis avenae* spreads from barberries in the State.

The authors claim that the first uredinia not directly traceable to local barberries are normally found in southeastern Nebraska the first week in June. They appeared about a week later in northern Nebraska and two weeks later in the western part of the State. This early infection is said to be scattered in small amounts over a wide territory as compared with the heavier local infection on grasses and grains near barberries. The reduction of stem-rust losses during the past six years is attributed to a decrease in the number of remaining barberries and a lack of sufficient moisture for the development of the rust localized near infected barberries and from sources outside the State.

As a result of their studies, the authors report 16 different physiologic forms of *P. graminis tritici* in Nebraska, one of which is new. Eight of these physiologic forms are classed as uncommon, and it is thought that the eradication of a large number of barberries may have eliminated some of these forms. The remaining forms were collected one or more seasons in either small or fairly large numbers. Six of the more common physiologic forms have been found in Kansas and in States south of Kansas, while two were collected near

infected barberries in Nebraska. It is assumed that some of these forms entered Nebraska as wind-blown urediniospores from these regions directly, or indirectly as progressive urediniospore generations. The authors claim that not until the barberry is completely eradicated will the importance of the remaining source of stem rust be determined.

Physiologic forms of wheat stem rust in western Canada, M. NEWTON and T. JOHNSON (*Sci. Agr.*, 7 (1927), No. 5, pp. 158-161).—The authors state that 17 physiologic forms were isolated in western Canada during the period 1919-1925. No correlation appears between the number of collections made each season and the number of forms isolated. Different physiologic forms dominate in different years. Virulent forms do not appear to overcome and destroy less virulent ones. Relatively few physiologic forms have been found in western Canada during any given season.

Greenhouse experiments on the relative susceptibility of spring wheat varieties to seven physiologic forms of wheat stem rust, M. NEWTON and T. JOHNSON (*Sci. Agr.*, 7 (1927), No. 5, pp. 161-165).—Stem rust (*Puccinia graminis tritici*), for many years the most destructive wheat parasite in western Canada, attacks all the common spring varieties, though some may occasionally escape damage on account of early ripening. Durum wheats, more resistant, tend to replace gradually the common varieties. The Dominion Department of Agriculture, through the establishment of a rust research laboratory at Winnipeg, is seeking to develop varieties adequately resistant and at the same time otherwise desirable. This is being attempted through combining the resistance of many partially resistant common wheat varieties, which involves the necessity of testing the rust resistance of all available promising wheat varieties and yields results permitting the comparison of the inherent or actual resistance of these varieties.

Of 23 common wheat varieties and crosses and 6 durum wheat varieties tested for resistance to 7 physiologic forms of *P. graminis tritici*—i. e., forms 21, 29, 30, 32, 34, 36, and an apparently new form—some resistance to these physiologic forms was shown by Marquillo, MacFadden Emmer, Marquis×Kanred (Minn. B-2-5), Sevier×Dicklow R. L. 368 (G. 149), and Webster. The Marquis×Kanred was immune to 4 of the 7 physiologic forms, but susceptible to each of the other 3. Of the durum wheats Iumillo and Pentad were highly resistant. Three varieties, Marquillo, Iumillo, and Pentad, appeared genetically impure. Most of the plants were resistant to a majority of the physiologic rust forms, but always a number appeared susceptible.

Inheritance in wheat of resistance to black stem rust, H. K. HAYES, E. C. STAKMAN, and O. S. AAMODT (*Phytopathology*, 15 (1925), No. 7, pp. 371-387, pl. 1).—In the present study on the inheritance of resistance of two types, it was necessary to make crosses and recrosses, the purpose being to obtain a desirable variety of *Triticum vulgare* resistant to all physiological forms of *Puccinia graminis tritici*. The details of the work, as summarized, show that all combinations of resistance and susceptibility of the parents were obtained in the hybrids. Homozygous types were obtained which contained the factors for resistance from both parents, as well as homozygous types which were susceptible under both greenhouse and field conditions.

Webster, a common wheat resistant to black stem rust, E. C. STAKMAN, M. N. LEVINE, and F. GRIFFEE (*Phytopathology*, 15 (1925), No. 11, pp. 691-698, fig. 1).—Webster (C. I. 3780), while not itself desirable for commercial growing as a hard red spring wheat, has proved to be relatively resistant to each of 19 physiologic forms of *Puccinia graminis tritici*, these including 5 physiologic forms to which no other common wheat is known to be resistant. Supposedly,

the resistance of Webster is due to the large amount of sclerenchyma in proportion to collenchyma in the stem. For this reason it is thought that it may be resistant to all physiologic forms of *P. graminis tritici*. Webster has 42 chromosomes and is therefore classed as a common wheat, although the spike is somewhat speltlike and the glume has a well-developed keel.

Field experiments on the control of stem rust by sulphur dust, D. L. BAILEY and F. J. GREANEY (*Sci. Agr.*, 7 (1927), No. 5, pp. 153-156).—Preliminary experiments gave encouraging results (*E. S. R.*, 57, p. 148), and further experiments were undertaken consisting of a continuation of the small plot trials and some preliminary field tests in which a horse-drawn duster was used.

Though the season was not satisfactory for these tests on account of comparatively slight stem rust attack, some distinctly promising results were obtained. The experience emphasized the difficulties to be met in extending the control method to general use. The cost of sulfur would probably not be a limiting factor and the practical difficulties incidental to applying the dust economically and effectively to standing crops should not prove insurmountable.

Further studies on flag smut of wheat, W. H. TISDALE, C. E. LEIGHTY, and B. KOEHLER (*U. S. Dept. Agr., Dept. Circ. 424* (1927), pp. 12).—The flag smut of wheat caused by *Urocystis tritici* is said to occur in Australia, China, India, Japan, Spain, South America, and the United States, its first discovery in the United States having been in St. Louis County, Mo., in 1918. In studies carried on in cooperation with the Illinois Experiment Station, the spores of the fungus have been found to live for a full year in infested straw buried in the soil at Granite City, Ill., and then to cause infection of wheat. Seed disinfectants prevented infection of wheat by flag-smut spores carried on the seed but did not control the disease satisfactorily in infested soils. A large number of varieties of wheat have been tested to determine their resistance to flag smut, and many have been found to be either highly resistant to or free from flag smut.

Steeping tests with Tillantin B and Tillantin C against wheat stinking smut [trans. title], J. BODNÁR and A. TERÉNYI (*Pflanzenbau [Berlin]*, 3 (1926), No. 5, pp. 73-75).—It is stated that both Tillantin B and Tillantin C justified their use as seed disinfecting treatments.

Preliminary environmental studies on the take-all disease of wheat caused by *Ophiobolus graminis* Sacc., H. H. MCKINNEY and R. J. DAVIS (*Phytopathology*, 15 (1925), No. 8, pp. 494, 495).—Results of experiments carried on in the greenhouse in Wisconsin soil temperature tanks show that *O. graminis*, the cause of wheat take-all disease, is under favorable conditions an unusually vigorous root and tiller parasite. The host was infected at all soil temperatures employed, 8 to 32° C., and at intervals of about 4°. The injury was greatest at 12° (53.6° F.) in soil of medium water content, whereas 16° produced the most severe injury in soils containing the greatest or the least moisture. The injury at 8°, though not great, was more severe than at 32°, and diseased plants were rarely found in soil held near 32°. A comparison is made with data from *Helminthosporium* foot-rot studies as made by McKinney (*E. S. R.*, 50, p. 649; 54, p. 649).

***Aplanobacter insidiosum* n. sp., the cause of an alfalfa disease**, L. McCULLOCH (*Phytopathology*, 15 (1925), No. 8, pp. 496, 497).—The alfalfa vascular bacterial disease briefly described by Jones (*E. S. R.*, 57, p. 843 has been submitted to the present author to determine the cultural and morphological characters of the bacteria. The present account describes the organism as *A. insidiosum* n. sp., the specific name expressing its rather slow but persistent progress in the host.

A note on the brown leaf-spot of alfalfa, L. R. TEHON and E. DANIELS (*Phytopathology*, 15 (1925), No. 11, pp. 714-719, fig. 1).—An alfalfa leaf spot which was noted in Illinois in 1922 and 1923, and which by 1924 had evidently begun to cause considerable loss over areas designated in different parts of the State, has been studied. It has been included in the new genus *Thyrosopora*, erected and described for this purpose, and it is technically designated as the new combination *T. sarcinaeforme*.

A myxomycete occurring in the smaller roots of beets, T. E. RAWLINS (*Phytopathology*, 15 (1925), No. 11, p. 727).—A heavy infection by a myxomycete has been consistently observed in the cortical cells of the smaller roots of sugar beets grown in the greenhouse. Preliminary studies thus far indicate that the organism is identical with that described by Nemec (E. S. R., 25, p. 145) as *Sorolpidium betae*. It has not yet been settled as to whether the organism is detrimental to the growth of the sugar beet.

Pythium infection of cabbage heads, C. DRECHSLER (*Phytopathology*, 15 (1925), No. 8, pp. 482-485, fig. 1).—To instances of disease caused by *Pythium* (E. S. R., 53, p. 851) the author now adds one of a cabbage decay, said not to have been described hitherto and to be caused by a fungus of the type usually classed as *P. debaryanum*, but showing marked departures from that species. Several species of *P. debaryanum* type from various plants produced similar pathological effects. Strains of *P. aphanidermatum* from diseased watermelon fruit and from cucumbers affected with cottony leak also gave positive results with cabbage.

Drop of Chinese cabbage and our common cabbage caused by *Sclerotinia sclerotiorum* (Lib.) Masee (*Sclerotinia libertiana* Fckl.), W. H. DAVIS (*Phytopathology*, 15 (1925), No. 5, pp. 249-259, pls. 2, figs. 3).—Manipulation and study are described as applied to sclerotia collected from Chinese cabbage and common cabbage in gardens of the Massachusetts Agricultural College and to derived cultures. Measurements indicated in general identity of the fungus with *S. libertiana* as described by Saccardo. Reinfections after isolation were readily obtained. No physiological races of the fungus were found on the hosts Chinese cabbage, head lettuce, and common cabbage. Germ tubes from ascospores failed to infect. The fungus did not progress on the soil surface more than 5 cm., but it did pass from diseased to healthy plants. The complete life cycle is not yet known, but it is supposed that ascospores form saprophytic mycelium and that this gives rise later in the season to parasitic mycelium. No Botrytis stage was found. The correct name of this fungus, it is claimed, is *S. sclerotiorum*. Teratological forms were observed in which the margins of apothecial cups formed secondary ascocarps by proliferation, and tertiary ascocarps were formed on secondaries. The teratological forms did not in general bear ascospores.

A mycorrhizal fungus found in the smaller roots of celery, T. E. RAWLINS and E. H. SMITH (*Phytopathology*, 15 (1925), No. 11, p. 727).—The smaller roots of celery grown in the delta peat soil of California are heavily infected by a mycorrhizal fungus, said to be a Phycomycete. This is similar to that described by Jones (E. S. R., 52, p. 746) as found in legumes and other plants, in that it is practically confined to the cells of the inner cortex, but is different from the fungus found in the pea (E. S. R., 53, p. 351; 54, p. 248).

A pyrenomycetous leaf spot of bur clover, L. E. MILES (*Phytopathology*, 15 (1925), No. 11, pp. 677-690, pls. 2, figs. 4).—Evidence is presented to show that a pyrenomycetous fungus causing a bur clover leaf spot near Auburn, Ala., is distinct from those causing leaf spots on alfalfa and clover, respectively, although the lesions are very similar macroscopically in these closely related

hosts. Sclerotoid bodies on the seed produced viable cultures on agar. Similar bodies produced in culture proved to be immature perithecia, capable of developing mature asci and ascospores under favorable conditions. Bur clover species and varieties all proved to be susceptible, though none of the alfalfas or clovers produced typical lesions. The fungus is described as the new species *Pseudopeziza medicaginis*.

Corn root-rot (*Kentucky Sta. Rpt. 1926, pt. 1, p. 14*).—The type of corn root rot previously reported (*E. S. R.*, 56, p. 143) has been produced by the addition of a pure culture of a large spored *Pythium*, and the organism was re-isolated from the lesions on the roots and from roots of plants inoculated with rotted corn roots from the field.

Sclerospora on corn in America, I. E. MELHIUS and F. VAN HALTERN (*Phytopathology*, 15 (1925), No. 11, pp. 720, 721).—The fact that *S. graminicola* is very prevalent in Iowa and adjacent States on *Setaria viridis*, a common cornfield weed, suggested trials to infect corn with this organism. Following up their success in using oospores in seed and soil, the authors tested corn varieties for susceptibility. Dent, sugar, pop, and flint varieties were attacked in percentages as high as 90, before the plumule appeared above ground.

The contrasting symptoms and effects on corn and on *Setaria* are outlined. The oospores overwinter in the soil and infect germinating foxtail grass seed in early spring. From such centers the fungus may spread by means of conidia. The fungus (oospores) can retain viability in soil for long periods of time, presumably infecting the successive crops. *S. graminicola* seems to have a wide host range. It was readily transferred to *Setaria italica*, *Panicum miliaceum*, *Euchlaena mexicana*, and 26 varieties of *Zea mays*, pop corn being the most susceptible and dent corn showing ready susceptibility in 12 varieties.

The reaction of selfed lines and crosses of maize to *Ustilago zeae*, F. R. IMMER and J. J. CHRISTENSEN (*Phytopathology*, 15 (1925), No. 11, pp. 699–707).—Previous investigations by Jones, which have been noted (*E. S. R.*, 41, p. 747), having shown that selection in self-fertilized lines can be used to isolate lines of maize differing markedly in their manner of reaction to *U. zeae*, the present study was started to investigate the mode of reaction of smut in the F_1 and the F_2 generations and back crosses where selfed lines of known inheritance were used as parents. The probable error method was used to determine what differences could be considered significant.

It is stated that the probable error in percentage decreased uniformly as the percentage of smut infection in the paired plants increased. The parent lines developed a uniform percentage of smut from year to year (1922–1924), the factors determining resistance or susceptibility being transmitted alike in both male and female gametes. Dominance of resistance or susceptibility to smut reaction was lacking. It is not known how many factors are involved. Low smut strains of corn selected under normal field conditions must be tested under smut-epidemic conditions to determine resistance. The inheritance of firing can be adequately explained on the basis of a single factor difference. No correlation appeared between smut and firing.

***Fusarium vasinfectum* and the damping off of cotton seedlings**, H. R. ROSEN (*Phytopathology*, 15 (1925), No. 8, pp. 486–488).—Observations in the field and tests in the laboratory and greenhouse involving pure culture inoculations indicate clearly that *F. vasinfectum* may prevent cotton seed from germinating properly, and may attack and kill young seedlings in a manner quite comparable to damping off caused by other fungi and bacteria.

Cladosporium spot of cowpea, M. W. GARDNER (*Phytopathology*, 15 (1925), No. 8, pp. 453–462, pls. 3).—In cowpea variety pla's at Lafayette, Ind., a spotting

of pods of Early Buff was observed in August, 1923 and 1924. Only young growing parts are susceptible, the peduncles and to a less degree the growing tips being thickly beset with sunken, small purplish lesions. Greenhouse inoculation tests were successful with 14 other varieties, Progressive White being very susceptible while Early Black and Taylor and especially Arlington showed high resistance. *Vigna sesquipedalis* is susceptible, *V. catjang* highly resistant. The organism, *C. vignae* n. sp., is seed-transmitted.

Two undescribed species of *Botrytis* associated with the neck rot diseases of onion bulbs, J. C. WALKER (*Phytopathology*, 15 (1925), No. 11, pp. 708-713, figs. 2).—Having followed up the results of the work of Munn (E. S. R., 38, p. 450), also the results of studies by himself alone or with others (E. S. R., 52, p. 846; 53, p. 351), the author herein distinguishes between *B. allii* and two forms described as new species and named, respectively, *B. byssoidea* and *B. squamosa*. These three species of *Botrytis* associated with onion neck rot are also described as to their cultural behaviors after being plated.

Collar-rot of peas: Incidence of the disease, W. D. REID (*New Zeal. Jour. Agr.*, 30 (1925), No. 4, pp. 250-255, figs. 4).—Pea collar rot, known locally for some years previously, became sufficiently important in 1924-25 to warrant inquiry. A preliminary investigation showed that the disease was present over several areas, which are indicated. The disease is described as varying in severity and economic importance.

Root rot or blight of canning peas, R. E. STONE (*Phytopathology*, 15 (1925), No. 5, p. 300).—Root rot and blight of canning peas is said to have caused much damage east and north of Toronto, many fields showing partial or total loss. Standard canning varieties especially susceptible include Rogers Winner, Alaska, Perfection, Surprise, Thomas Laxton, Advances, Market Gardener, First Earlies, White Admiral, and Horsford. Tests with certain selections gave hope of securing a good canning pea in case of Horel, a hybrid developed in Wisconsin, and of selections developed in Michigan.

Corticium-disease of potatoes: Experiments in control, G. H. CUNNINGHAM (*New Zeal. Jour. Agr.*, 30 (1925), Nos. 1, pp. 14-21, figs. 8; 2, pp. 93-96, figs. 2).—Seed potatoes treated for *Corticium* disease (*C. vagum solani*) by immersion for 1.5 hours in 1:1,000 mercuric chloride were found to be only 30 per cent viable. Experimentation testing the adequacy and safety of standard and other solutions was carried out in an elaborate manner, here detailed or graphed, for mercuric chloride at strengths of 1-500, 1-750, 1-1,000, 1-1,250, 1-2,000, and 1-2,500, the time of immersion being 15, 30, 45, 60, and 90 minutes. Usual strengths (1-1,000 to 1-2,000), or even greater, of mercuric chloride did not give complete killing of the sclerotia. The presence of bubbles was a disturbing factor. High concentrations (1-200 down to 1-400), though effective when kept in contact with the seed potatoes for 2 hours, were too expensive to be practical.

Uspulun was inefficient, as was also copper sulfate. Mercuric chloride was then further tried. It was noted that when even as little as 0.01 per cent of hydrochloric acid was added better results were obtained. There was a definite relationship between the amount of acid added and the killing effect on the sclerotia, so that mercuric chloride, when so acidulated, killed all sclerotia even at strengths much less than those usually recommended. These experiments solved the problem so far as effectiveness of steeping was concerned, and that of cheapening the large scale (machine treatment) costs (material and labor) was undertaken. A 16-hour and a 5-minute mercuric chloride treatment are outlined with directions.

Taxonomic studies of the organism causing black-dot disease of potato, B. T. DICKSON (*Phytopathology*, 15 (1925), No. 5, p. 300).—The potato black dot

organism (E. S. R., 55, p. 147) should, it is thought, be designated as *Colletotrichum atramentarium*. It is said to be different from *C. maculans* only in spore shape. Cultural studies indicate that, while isolations from Quebec, England, France, Pennsylvania, Ohio, and West Virginia give the same organism, both physiological specialization and saltation occur.

Potato leaf roll as affecting the carbohydrate, water, and nitrogen content of the host, E. G. CAMPBELL (*Phytopathology*, 15 (1925), No. 7, pp. 427-430, figs. 3).—It is emphasized that the potato plants used in this study were grown under identical greenhouse conditions; that the plants were harvested prior to tuber formation; that the entire above-ground portion of the plants was crushed and used in the analyses; and that in comparison with healthy plants the leaf-roll plants invariably showed higher dry weight, higher carbohydrates (sugars and starch), higher carbon : nitrogen ratio, and a nitrogen percentage as high as that of the healthy plants on the dry weight basis and higher on the fresh weight basis.

Relation of growth of *Helminthosporium sacchari* to maintained temperatures, F. F. HALMA and H. S. FAWCETT (*Phytopathology*, 15 (1925), No. 8, pp. 463-469, figs. 3).—Studies on material submitted by H. A. Lee of the Hawaiian Sugar Planters' Association are described, in which *H. sacchari* was grown in standard nutrient agar and in bouillon at eight different temperatures. The fungus showed an optimum growth range of from 20 to 29° C. (68 to 84.2° F.) Within this range the reaction of the bouillon became distinctly alkaline, while outside this range growth was weak and only slight change in pH occurred. In nutrient agar the growth optimum remained constant at 29° for the first seven days, after which growth at that temperature ceased.

[Diseases of sugar cane in Porto Rico] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926, Spanish ed.*, pp. 44-46).—Brief notes are given on sugar-cane mosaic, the attacks of *Helminthosporium sacchari* and *Leptosphaeria sacchari*, and on gummosis.

Gumming disease of sugar-cane in the British West Indies, S. F. A[SHBY] (*Trop. Agr. [Trinidad]*, 3 (1926), No. 3, pp. 50, 51).—J. Matz is credited with calling attention, late in 1925, to the presence of gumming disease in the Experiment Station at La Guerite, St. Kitts, on the seedling cane H 109, said to have been introduced from Hawaii in 1923. Ba 6032, Ba 11569, Transparent, and a so-called African cane (probably Bourbon) were also attacked. It is thought that its presence in St. Kitts may be connected with its earlier presence in Porto Rico. From gummed cane in St. Kitts two yellow bacteria have been isolated, one of which behaves like *Bacterium vascularum* in pure culture, while the other does not.

A cytological study of *Ceratostomella fimbriata* (E. & H.) Elliott, J. A. ELLIOTT (*Phytopathology*, 15 (1925), No. 7, pp. 417-422, pls. 2).—A cytological study, here recorded as undertaken in confirming the decision that the so-called pycnidial stage of the sweet potato black rot fungus is in reality a perfect or sexual stage (E. S. R., 53, p. 854), and as completed in certain respects by others named, after the author's death, presents phenomena observed from the study of *C. fimbriata* which are detailed and summarized.

The relation of soil moisture to the pox or ground rot disease of sweet potatoes, R. F. POOLE (*Phytopathology*, 15 (1925), No. 5, pp. 287-293, figs. 4).—Sweet potato pox or ground rot (*Cystospora batatas*) has proved to be most severe in dry seasons. It attacks the Big Stem, Red, Vineless and Yellow Jersey, Triumph, Dooley, Nancy Hall, and Porto Rico varieties, being most severe on Jersey varieties. The organism remained very active though kept in air-dried soil all winter before being used in these tests. Triumph was not

attacked at the water-holding capacity of the soil used, i. e., 15 to 20 per cent, though slightly attacked at 5 and 2 per cent. Keeping the moisture as low as 2 per cent for 14 days resulted in severe infection of all roots of Triumph that had grown in high moisture percentages. Vineless Yellow Jersey showed no infection in soil saturated at 18 per cent and very slight infection above 12 per cent. Infection was higher at 8 per cent, but most serious at 6 and 4 per cent. Maximum production of potatoes as well as of vines and roots occurred between 10 and 16 per cent above the critical point of infection.

The results suggest irrigation, the increase of organic matter (to increase drought resistance), and study of the effects of different depths of plowing and planting.

Varietal resistance of sweet potatoes to nematodes, *Heterodera radicola* (Greef.) Müller, in California, J. L. WEIMER and L. L. HARTER (*Phytopathology*, 15 (1925), No. 7, pp. 423-426).—As a result of a study extending back to the spring of 1923, the results of which are tabulated with discussion, it is stated that Red Jersey, Little Stem and Big Stem Jerseys, Porto Rico, Southern Queen, or Yellow Belmont varieties, though not immune, are highly resistant, and that they might well be substituted for the more susceptible varieties on nematode-infected land.

[Tobacco diseases in Kentucky] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 7, 8*).—A summary report is given of the results of investigations on frenching and mosaic diseases of tobacco.

Turkish tobacco is said to french when terminal growth proceeds more rapidly than the necessary nitrogen intake from the soil. Frenched plants recovered their normal color when readily available sources of nitrogen were added to the soil. In pot cultures the disease was produced in virgin soil high in organic matter, old cultivated soil low in organic matter, and in sand cultures.

In studying tobacco mosaic it was found that certain brands of cigarettes, granulated smoking tobaccos, and plug chewing tobaccos carried the mosaic virus in an active state. Samples of ground or leaf tobacco, ranging in age from 5 to 31 years, gave positive results when a water decoction was rubbed on healthy tobacco plants. It is said that at the Western Kentucky Substation tobacco plants set by men using infected chewing tobacco developed a high percentage of mosaic, while check rows set after washing the hands developed a low percentage.

Two distinct types of mottled mosaic are reported common in the tobacco fields of Kentucky, and they remained very distinct through 15 generations of plants in the greenhouse. A third type, differing from the others in that necrotic spots are commonly developed in inoculated plants in the greenhouse, was also found. A virus disease of tobacco characterized by chlorotic spots in the growing point, rather than by mottling, and by extensive necrotic patterns on the older leaves was studied in the greenhouse and field, and is considered distinct from tobacco mosaic as it is ordinarily recognized.

A ring spot of tobacco, in which no symptoms of mosaic were seen, was found to be nearly as readily transmitted as tobacco mosaic. A row of Burley tobacco plants in a field inoculated with a mosaic tomato plant developed a disease which caused the death of all the leaves present on the plant at the time of inoculation.

Winter blight or streak in tomatoes, R. E. STONE (*Phytopathology*, 15 (1925), No. 5, p. 300).—Good results have been obtained in controlling tomato winter blight (which is associated with excess nitrogen and deficient potash and phosphoric acid) in commercial greenhouses by increasing phosphoric acid and potash in fertilizers.

A bacterial disease of tomatoes new to British Columbia, H. R. McLABITY and T. M. C. TAYLOR (*Phytopathology*, 15 (1925), No. 5, p. 302).—A bacterial disease of tomato is reported as appearing for the first time in British Columbia. The extent appears very limited, but the loss ranges as high as 75 per cent. Inoculation tests were successful. The organism is supposedly identical with *Aplanobacter michiganense*.

High evaporation: A precursor and a concomitant of western yellow tomato blight, M. SHAPOVALOV (*Phytopathology*, 15 (1925), No. 3, pp. 470-478, figs. 6).—In western yellow tomato blight a certain seasonal march of evaporation means a definite progress of blight during that season. A study of weather reports and of blight conditions is presented, showing a striking correlation between evaporation and blight.

When evaporation drops to a low level for a more or less protracted period, blight is arrested and a degree of recovery is shown which may become complete and is regarded as significant scientifically. Evaporation data are regarded as indispensable for tomato blight studies, as well as for a better understanding of the normal growth of the plant.

Club-root in turnips: Trials with "disease-resistant" varieties in Otago and Southland, R. B. TENNENT (*New Zeal. Jour. Agr.*, 30 (1925), No. 4, pp. 259-269).—During 1923-24, field variety trials of turnips, both soft and swede varieties, for resistance to club root were held, and the results are here noted. Reference is here made chiefly to the dry rot organism (*Phoma napo brassicae*) and to the club root or finger-and-toe organism (*Plasmiodiophora brassicae*).

No turnips appeared immune to club root, though some showed fair resistance. Two varieties, Bangholm swede and Irvine Green-top Yellow turnip, showed promise, suggesting further trial under more exacting conditions.

Fumigation injury of watermelons, G. B. RAMSEY (*Phytopathology*, 15 (1925), No. 8, pp. 479-481, fig. 1).—A peculiar blistering and pitting injury to watermelons shipped in certain cars closed tightly and fumigated as a precaution against foot-and-mouth disease was reproduced experimentally by formaldehyde fumigation.

"The fact that not all fumigated cars showed injury indicates that a careful study of the technique of application with due attention to environmental factors may be expected to indicate a procedure which is both safe and effective should occasion again arise for fumigating watermelons."

Further studies on pythiaceus infection of deciduous fruit trees in California, R. E. SMITH and E. H. SMITH (*Phytopathology*, 15 (1927), No. 7, pp. 389-404, figs. 6).—Since the publication of the discovery, description, and detailed account of *Pythiacystis citrophthora*, as previously noted (E. S. R., 19, p. 658), several new species of *Phytophthora* have been described representing types which obscure the distinction between these genera. Pathogenic strains have been found which form a closely connecting series between typical *Pythiacystis citrophthora* and fungi of the *Phytophthora cactorum* type. A brief description of five of these types is given with comparisons. Fungi of this type cause crown or trunk canker in-nursery and orchard trees of pear, peach, almond, apricot, cherry, plum, prune, and black walnut, and much damage is done to nursery trees by such diseases, particularly in wet seasons. Forms described by the authors and others apparently obscure the present distinction between the genera *Pythium*, *Phytophthora*, and *Pythiacystis*. If these genera are merged the name *Pythium* should be preferred. The present delimitation of these genera appears to be uncertain.

Incidence of apple-canker (*Nectria galligena* Bres.) in New Zealand, G. H. CUNNINGHAM (*New Zeal. Jour. Agr.*, 31 (1925), No. 2, pp. 102, 103, fig. 1).—

The author reports the existence of apple canker (*N. galligena*) in Whangarei, outlining characters distinguishing this disease from black rot.

Spray injury to apple, H. C. YOUNG and R. C. WALTON (*Phytopathology*, 15 (1925), No. 7, pp. 405-415, pl. 1, fig. 1).—In the data here reported, evidence is presented as to the part played by soluble material in the spray mixtures in apple leaf burning and fruit russetting. When such soluble compounds as electrolytes of strong coagulating power come in contact with the protoplasts of very active cells, injury may result through plasmolysis and coagulation. This may be particularly evident when the leaf has been injured, as by fungi (possibly also by violent sprayings), so that the soluble fungicide can diffuse through the dead or injured cells to the active living tissue. Climatic and chemical factors may also be operative.

Presence of the European brown-rot fungus in America, W. N. EZEKIEL (*Phytopathology*, 15 (1925), No. 9, pp. 535-542, figs. 3).—Studies outlined as following up conclusions previously announced (E. S. R., 53, p. 448) gave isolations of a fungus from California fruits which was identified as the true European brown rot fungus, *Sclerotinia cinerea*, as was also the spur blight *Monilia* from Oregon. Methods are outlined as effective in distinguishing the species from *S. americana*. *M. oregonensis* agrees as regards morphology, cultures, and life history with *S. cinerea*, with which it is regarded as synonymous. *S. cinerea* causes blossom and twig blight injury, with little fruit rot, to hosts through a wide range, but it is probably not so destructive as *S. americana* where both occur together.

Cane-wilt attacking blackberry (*New Zeal. Jour. Agr.*, 31 (1925), No. 5, pp. 301, 302).—Reports are said to have been made recently from several parts of Auckland Province concerning a blight attacking blackberry. The disease proves to be due to *Leptosphaeria coniothyrium*.

A bacterial wilt disease of bananas in Trinidad caused by *B. solanacearum* E. F. SM., S. F. ASHBY (*Trop. Agr. [Trinidad]*, 3 (1926), No. 6, pp. 127-129).—An account, extending historically as far back as 1910, is given of a banana vascular bacterial disease in Trinidad. *Bacillus solanacearum* is thought to be the causal agent. The susceptibility of banana varieties to this disease is not the same as susceptibility to *Fusarium cubense*. Giant Fig and Governor are highly resistant to Panama disease, but susceptible to the bacterial disease. The resistance of Gros Michel to bacterial disease has yet to be determined under field conditions, where infection may be expected to occur normally from the soil.

The citrus stem-end rot "Diplodia": Its life history and relation to *Sphaeropsis malorum*, N. E. STEVENS and M. S. WILCOX (*Phytopathology*, 15 (1925), No. 6, pp. 332-340, pl. 1).—Using the name *D. natalensis* to indicate the organism causing a citrus fruit stem-end rot in Florida, and the name *S. malorum* to indicate the apple black rot fungus which is common in the eastern United States, the authors state that the perfect stage of *S. malorum* (*Physalospora malorum*) has twice been found on citrus. The perfect stage of *D. natalensis* is a *Physalospora* very similar to *P. malorum*. Distinctive characters are indicated in some detail.

Plasmopara viticola* on *Ampelopsis veitchii [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 2, pp. 129, 130).—An account is given with brief discussion of the attack at Laugnac, Department of Lot-et-Garonne, France, on *A. vietchii* by *P. viticola*.

Notes on the parasitism of *Endothia gyrosa* (Schw.) Fr., J. R. WEIR (*Phytopathology*, 15 (1925, No. 8, pp. 489-491, fig. 1).—Brief notes are given of observations and tests with *Endothia gyrosa* on *Quercus velutina* and *Fagus*

americana. Though normally, at least, a wound parasite, this fungus when artificially inoculated is able to increase gradually the infected area through the activities of its own mycelium, the process resulting in the death of the root or that part above the ground. It enters entirely through wounds, and may continue indefinitely, producing its stromata over a restricted area. With a cumulative vegetative growth it may gradually acquire more decidedly parasitic tendencies.

A study of decay in the balsam fir. A. W. MCCALLUM (*Phytopathology*, 15 (1925), No. 5, p. 302).—This report on a balsam fir study carried out in Quebec in 1923, which involved red heart rot (*Stereum sanguinolentum*) and feather (butt) rot (*Poria subacida*?), noted a description of the characters of these decays. In balsam fir cut for pulp wood a direct relation was found to exist between age and decay, the cull rising from 0 per cent in the 51- to 60-year-age class to 40 per cent in the 181- to 190-year-age class. The recent bud worm outbreak showed no important effect on the condition of balsam fir.

Polyporus schweinitzii Fr. on Douglas fir in the eastern United States. G. G. HEDGCOCK, G. F. GRAVATT, and R. P. MARSHALL (*Phytopathology*, 15 (1925), No. 9, pp. 568, 569).—A plantation of young Douglas fir on an estate near Biltmore, N. C., has not thrived. Weakening rots found in butts and roots of fallen trees in association with *P. schweinitzii*, which seriously injures only the older trees of Douglas fir in the northwestern parts of the United States, would indicate a greater virulence in the strain of this fungus present, or a higher susceptibility than is usual of the host in this locality. It is thought that the fungus may have spread from some other species, as pine, spruce, fir, and hemlock are known to be attacked in this region.

The control of stain, decay, and other seasoning defects in red gum. L. V. TEESDALE (*U. S. Dept. Agr., Dept. Circ. 421* (1927), pp. 19, pls. 7, fig. 1).—In this study with red gum (*Liquidambar styraciflua*) spray treatments of gum logs with cresylic acid mixed with kerosene or crude oil are said to have proved effective in preventing decay and greatly retarded the spread of stain for periods of five weeks of hot summer weather and three months of late summer and fall weather. This treatment is particularly recommended for preventing stain and other defects in the sapwood of the gum, and in addition attention must be given to the piling and drying of the lumber.

Chlorosis of pin-oaks (*Kentucky Sta. Rpt. 1926, pt. 1, p. 18*).—The occurrence of a chlorosis of pin oaks, occurring both in the nursery and in plantings at Lexington and vicinity, is reported. The chlorotic plants are said to develop in areas where large amounts of calcium carbonate occur in the soil. Chemical analyses of chlorotic and healthy leaves showed that the manganese content was low in the chlorotic leaves. The other mineral constituents appeared to be about the same in both.

Notes on sporophores of Polyporus schweinitzii Fr. on yellow pine in California. L. S. GILL (*Phytopathology*, 15 (1925), No. 8, pp. 492, 493).—Evidence briefly discussed is considered to strengthen the presumption that in California *P. schweinitzii* causes considerable decay in yellow pine. Apparently, however, it fruits sparingly on this species and produces sporophores only where injury by fire or other agency permits the mycelium to grow out from the heartwood to the exterior. It is thought possible that the common form with the central stipe arising from surface roots also depends upon the presence of wounds for its development.

Anthracnose of European privet. A. J. MIX (*Phytopathology*, 15 (1925), No. 5, pp. 261-272, figs. 3).—Anthracnose of European (English) privet, caused by the imperfect stage of *Glomerella cingulata*, is said to have been destructive

during recent years to privet hedges in and near Kansas City, Mo. Twig blight, twig canker, and base girdling cankers may be found. The girdling cankers are fatal, but not always in the season in which infection occurs. *G. cingulata* is not pathogenic to Amur, Ibota, Regel, or California privets. Apparently the fungus can, in nature, enter unwounded tips of growing twigs of European privet. Positive results followed inoculation of twigs of European privet with a pure culture of *G. cingulata* from apple. Some strains of *G. cingulata* from privet decay apples as readily as does *G. cingulata* from apple; others less readily, still others not at all. Hedge privets suggested as substitutes for the Middle West are Ibota and Amur.

A disease of seedlings and twigs of privet [trans. title], O. BECK (*Ztschr. Pflanzkrankh. u. Pflanzenschutz*, 36 (1926), No. 3-4, pp. 65-71, figs. 7).—A disease of privet seedlings and of twigs on older plants near Vienna was noted in 1925. As the result of the study here outlined, the organism is described as the new species *Gnomonia cingulata*, the connection of which with *Myzospodium cingulatum* is regarded as proven by facts here presented. A post-manuscript note refers to the account of European privet disease in Missouri, by Mix (noted above).

The problem of host selection and host specialization of certain plant-infesting nemas and its application to the study of nematode pests, G. STEINER (*Phytopathology*, 15 (1925), No. 9, pp. 499-534, figs. 8).—Presenting a bibliographical and experimental study of the problem of the host selection mechanism of nematodes as combined with existing host specialization, in order to clear up obscure points and to render it possible to work out effective control methods, the author attempts to show how plant parasitic soil nematodes distinguish and locate their hosts.

The behavior of nematodes varies, as they appear to prefer always the host species or even the variety on which the parents lived, preference growing indefinitely, often to a very high degree, with the number of generations spent on a given variety. Former host history and possibility of choice are always important. The growing plants produce some root secretions which are carried by the soil water and act as stimuli upon the nematodes, which apparently perceive the stimuli with a sense organ called the amphid or lateral organ, which is thought to be a chemical sense organ. Presumably by aid of these amphids, the nematode moves toward points of higher concentration of the stimulating fluid and so finally locates its host. The structure of the amphids of a few plant-parasitic nematodes is for the first time described and their importance discussed. The dominating significance of the host selection mechanism is shown.

Flagellates in plants: A review of foreign literature, M. BENSUADE (*Phytopathology*, 15 (1925), No. 5, pp. 273-281).—It is stated that, though the parasitism of plants by flagellates has been reported by authors from many localities as affecting several hosts, and though considerable work has already been done in this field, the matter has been ignored by phytopathologists and until recently by botanists. A brief review is given of the literature, 33 titles by 16 authors being listed.

Geographical distribution of the milkweed flagellate, *Herpetomonas elmassiani* (Migone), F. O. HOLMES (*Phytopathology*, 15 (1925), No. 5, pp. 297-299, fig. 1).—*H. elmassiani* was in 1916 found to occur in latex of *Araujia angustifolia* in Paraguay. In 1923 a flagellate morphologically indistinguishable from this was found in latex of *Asclepias syriaca* in Maryland, and was later found to occur as far north on the Atlantic coast as the northern bound-

ary of New Jersey, though examinations in New York State and in Massachusetts gave negative results.

Non-pathogenicity of the milkweed flagellate in Maryland, F. O. HOLMES (*Phytopathology*, 15 (1925), No. 5, pp. 294-296).—*Herpetomonas elmassiani* may be present in very large numbers in the latex of *Asclepias syriaca* without showing interference with the normal growth of the plant or apparently modifying the leaves, stems, or seed pods.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Experimental fur farm of the Biological Survey, F. G. ASHBROOK and K. B. HANSON (*U. S. Dept. Agr. Leaflet 6* (1927), pp. [2]+6, figs. 4).—This is a description of the experimental fur farm maintained by the Biological Survey in the Adirondack region of New York for the purpose of determining the most satisfactory methods of raising fur animals in captivity; ascertaining conditions under which the various species can be raised profitably and produce good fur; developing improved strains by selective breeding of promising species; learning the breeding, gestation, whelping, and prime-fur periods; and investigating diseases and parasites and determining methods of prevention and treatment. The data are presented under the headings of location and history of the farm, stock and equipment, feeding methods, sanitary precautions, and accomplishments from the experiments.

Game laws for the season 1927-28: A summary of the provisions of Federal, State, and Provincial statutes, F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1550* (1927), pp. II+46).—This is the annual summary of the provisions of Federal, State, and Provincial statutes (E. S. R., 55, p. 657).

Revision of the American lemming mice (genus *Synaptomys*), A. B. HOWELL (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 50* (1927), pp. II+38, pls. 2, figs. 11).—In this revision the author recognizes two subgenera and eleven forms belonging to the genus. A bibliography of six pages is included.

The feeding range of certain birds, W. K. BUTTS (*Auk*, 44 (1927), No. 3, pp. 329-350, figs. 3).—This is a report of observations on the white-breasted nuthatch, chickadee, downy woodpecker, tree sparrow, junco, song sparrow, and robin.

Rat-flea surveys and their use as a guide to plague preventive measures, L. F. HIRST (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 21 (1927), No. 2, pp. 87-104, figs. 3).—It is pointed out in this contribution that the results of recent experiments in Colombo with much larger numbers of fleas tend to confirm an earlier conclusion that *Xenopsylla astia* is a relatively inefficient vector of rat plague under tropical conditions as compared with *X. cheopis*. The paper considers methods of investigation and topographical, statistical, and practical aspects.

[Attack of snail by luminous larva of the firefly] (*Jour. N. Y. Ent. Soc.*, 35 (1927), No. 3, p. 315).—Reference is made to a study by M. Miyajima, of Tokyo, Japan, in which it was found that the snail host of the liver fluke is attacked by the luminous larva of the firefly *Luciola picticollis*. Thus the spread of the parasite and the disease it causes are checked.

[Work in economic entomology at the Kentucky Station] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 19, 20*).—In control work with the Mexican bean beetle liquid sprays gave slightly better control than the dusts. A spray consisting of calcium arsenate 0.75 lb. and lime 1.5 lbs. in 50 gal. of water and a dust of calcium arsenate 1 lb. and hydrated lime 9 lbs. gave slightly better protection

than any of the other insecticides used. In tests for the suppression of the cucumber beetle, sodium fluosilicate did not give as satisfactory results as other poisons, proving, in mixtures of 1 lb. of the poison to 3 lbs. of hydrated lime or land plaster, seriously injurious to the plants.

Annual report department of entomology, R. W. HARNED ET AL. (Mississippi Sta. Rpt. 1926, pp. 16-20).—Included in this report are an account of progress on pecan insects since October 1, 1925, by J. M. Langston; a brief summary report, July 1, 1925, to April 30, 1926, by A. L. Hamner, in which he discusses the cotton aphid and the obscure scale; and a report on crawfish work, May, 1925, to April 30, 1926, by R. N. Lobdell. The spraying experiments with the obscure scale tended to show that a 3 per cent heated oil emulsion spray will satisfactorily control this insect.

[Notes on economic insects in Porto Rico] (Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926, Spanish ed., pp. 46, 47, 48, 49).—Brief reference is made to the occurrence of white grubs and the value of their parasites, the occurrence of the lepidopteran *Sufetula grumalis* Schaus. attacking the tender roots of sugar cane, of the banana root borer, which has spread as far as Utuado, of the dipteran *Euxesta notata* found not to attack citrus, and the West Indian fruit fly reared from the hog plum (*Spondias mombin*).

A survey of the insect pests of mid and west Wales, J. R. W. JENKINS (Welsh Jour. Agr., 3 (1927), pp. 196-220).—A summary of information on the economic insects of western Wales.

Report of the chief entomologist for the year 1926, R. W. JACK (South Rhodesia Dept. Agr. Rpt. Sec. 1926, pp. 23-27).—This is a summary of information on the more important insects of the year and control work conducted, and continues the reports previously noted (E. S. R., 56, p. 57).

[Report on entomology], C. FULLER ET AL. (So. and East African Agr., Cotton, Ent., and Mycol. Conf., Nairobi, Proc., 1926, pp. 170-200, 228-242).—This report includes information of general interest in connection with the major cotton pests (pp. 170-184, 233, 234, 238-242); biological control of insect pests, with particular reference to the common coffee mealy bug in Kenya Colony (pp. 184-196); *Lycidocoris mimeticus*, a potential pest of coffee (pp. 196-198); and an account of the pink boll worm and other worms affecting cotton (pp. 228-233, 234-238).

Insects attacking vegetables, L. CAESAR (Ontario Dept. Agr. Bul. 325 (1927), pp. 63, figs. 46).—A practical summary of information on the importance of insect enemies of vegetables in Ontario and means for their control.

Manual of forest insects, H. B. PEIRSON (Maine Forest Serv. Bul. 5 (1927), pp. 130, figs. 11).—The author here presents a general survey of the insects destructive to forest trees in New England. The main part of the work consists of a discussion of host trees and their enemies arranged according to host, 21 in number.

Defects in timber caused by insects, T. E. SNYDER (U. S. Dept. Agr. Bul. 1490 (1927), pp. 47, figs. 45).—This is a discussion of the defects in timber resulting from insect attacks, considered under the headings of pinholes, grub holes, powder post, and other types. It is thought that much of this loss can be prevented through proper methods of lumbering and management, usually involving but slight changes or modifications in present handling of the timber.

A list is given of 51 references to the literature cited.

What our insects cost us, A. GIBSON (Sci. Agr., 7 (1927), No. 11, pp. 440-445).—This is a summary of information on the economics of insect control in Canada.

Increasing nicotine evolution from tobacco dust, W. RUDOLFS (Jour. Econ. Ent., 20 (1927), No. 2, pp. 430, 431).—This contribution from the New Jersey Experiment Stations reports briefly upon work conducted in continuation of studies previously noted (E. S. R., 52, p. 849).

The snowy tree cricket: Its injury to prunes and methods of combating it, C. WAKELAND (Idaho Sta. Bull. 155 (1927), pp. 29, figs. 19).—This is a report of studies of the snowy tree cricket, which has been a source of damage to prunes in southern Idaho since 1912. Up to the year 1921 it had been confined almost entirely to two small localities, but in that year it attracted considerable attention in the Boise and Payette Valleys and in 1923 and 1924 it was the chief insect enemy of prunes in southern Idaho. Another species that attacks prunes in southern Idaho is known as the four-spotted tree cricket.

It was found that one application of arsenical at the proper time would almost completely eradicate the tree crickets from a prune orchard and prevent loss entirely for the season. The experiments showed that good results may be obtained with not more than 0.14 lb. of calcium arsenate per tree, and it is recommended that infested orchards be dusted with calcium arsenate or sprayed with lead arsenate after the crickets begin to eat the leaves freely and before they attack the fruit. When spraying is done, lead arsenate should be used at the rate of 4 lbs. per 200 gal. of water. When dusting is employed, calcium arsenate should be applied at the rate of about 0.14 lb. per tree for 12- to 15-year-old prune trees.

Studies of tree crickets by Parrott and Fulton at the New York State Station (E. S. R., 31, p. 649) and by Fulton (E. S. R., 55, p. 659) have been noted.

Lygus elisus: A pest of the cotton regions in Arizona and California, E. A. MCGREGOR (U. S. Dept. Agr., Tech. Bul. 4 (1927), pp. 15, figs. 7).—This is a report of studies of the tarnished bug (*L. elisus* Van Duzee), thought to be the most serious pest of cotton in California.

In the Imperial Valley, where it was chiefly observed, growing alfalfa was more extensively attacked than cotton, but the injury is less serious owing to the fact that the pest distributes its attack to all parts of the foliage on alfalfa, while on cotton it concentrates on the buds, blooms, and bolls, the sole productive portion of the plant. Its injury to cotton is caused by the feeding punctures made in the square, bloom, and boll by the piercing mouth parts. Practically all stung squares, blooms, and very young bolls are very soon shed. Development begins early in the spring in the Imperial Valley. Under summer conditions hatching requires about 4 days, and the bugs become adult in about 20 days. It attacks alfalfa during the greater portion of its growing season, while the attack on cotton is limited to the period from early June to early in September. As a result, there are about seven generations per year on alfalfa and about four generations on cotton.

Finely divided sulfur dust was found to be an effective means of control. Applied to growing alfalfa at the rate of 6 lbs. per acre, a single application of this material brought about a reduction of *Lygus* individuals amounting to 75 per cent of the original infestation. A similar application to infested cotton practically eliminated the pest and kept the infestation down to a minimum for more than three weeks.

An account of this insect and its injury to cotton in Arizona by Morrill, who has given it the name cotton square dauber, has been noted (E. S. R., 42, p. 357; 43, p. 757).

The beet leaf-hopper (Eutettix tenellus Baker): A survey in Idaho, R. W. HAESELE (Idaho Sta. Bul. 156 (1927), pp. 28, figs. 13).—This is a detailed report of studies of the distribution of the beet leafhopper in Idaho, most of the data being given in tabular form.

It was found that the most common host plants are also the most commonly distributed weeds in all the farming communities of the State. The occurrence of the beet leafhopper corresponds with the distribution of these host plants regardless of the presence of sugar beets. It was repeatedly collected throughout the season in as great numbers or greater from areas of Russian thistle, mustard, red scale, and *Bassia hirsuta* as from sugar beet fields, so that the sugar beet is not necessarily the favorite food plant of the beet leafhopper, other conditions being equal. It was found that the leafhopper is apparently two-brooded, with a possible third brood.

A list is given of the plants from which the leafhoppers were collected.

The biological and ecological aspect of migration in aphides, I, II, J. DAVIDSON (*Sci. Prog.* [London], 21 (1927), No. 84, pp. 641-658, figs. 2; 22 (1927), No. 85, pp. 57-69, fig. 1).—Part 1 is a contribution from the Rothamsted Experimental Station which discusses types of migration from trees or shrubs to (1) herbaceous plants, (2) roots of herbaceous plants, (3) roots of other trees or shrubs, and (4) to other trees or shrubs. A discussion of the phylloxerons and the "chermes" is included.

Part 2 deals with the subject under the headings of origin and development of the migrating habit, parthenogenetic generations, and sexual generations.

The tulip or iris aphid in Santa Cruz County, California, C. F. DOUCETTE (*Jour. Econ. Ent.*, 20 (1927), No. 2, pp. 431, 432).—*Anuraphis tulipae* Fonsc. has for several years been a pest to bulbs around Santa Cruz, where the bulbous iris appears to be the favorite host and the infestation is most serious during the summer months while the bulbs are in the storage shed. Tests of fumigation with calcium cyanide resulted in nearly 100 per cent mortality of the aphids without affecting the bulbs.

The aphid situation, J. R. WATSON (*Citrus Indus.*, 8 (1927), No. 7, pp. 8, 9).—This paper, presented at the annual meeting of the Florida State Horticultural Society, reviews the status of this pest during 1926-27. Climatic conditions, particularly the destruction of the tender growth by freezes in late December and early January, were responsible for the starvation of the aphids and the resultant large practical control.

A list of Coccidae (scale insects) known from China, I. KUWANA (*Lingnaam Agr. Rev.*, 4 (1927), No. 1, pp. 70-72).—A list is given of the Coccidae recorded from China, together with their host plants, arranged in systematic order.

Observations on *Bucculatrix gossypiella*, a new and important cotton pest, A. W. MORRILL (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 536-544, pls. 3).—This is an account of a species of cotton-infesting *Bucculatrix* (family Lyonetiidae), *B. gossypiella* Morrill, which infests wild and cultivated cottons in the States of Sonora and Sinaloa, Mexico. The larvae have the peculiar habit of boring in woody or hard tissues of the plant, such as stalks, branches, carpels of green bolls, leaf petioles, and larger leaf veins, as well as in the leaf blades and bracts, and with decided preference for the harder parts. Characteristic reddish spots are produced by the work of the larvae in the plant tissues. Damage appears to be confined to the staining of the lint and to producing deformed and imperfectly opened bolls, usually amounting to between 10 and 30 per cent of the crop. Observations to date indicate that early planting favors maximum damage and late planting favors minimum damage, but local concerted action as to delayed planting and clearing of old cotton fields may be necessary where large acreages are involved.

Observations on the habits and life history of the moth *Lophoptilus cloisella*, M. A. MYERS (*Jour. N. Y. Ent. Soc.*, 35 (1927), No. 3, pp. 241-244,

figs. 2).—This is a report of observations at Ithaca, N. Y., of the biology of a moth the larvae of which bore in the stem of the primrose. In 1926 the larvae and pupae were found to be very heavily parasitized by *Ephurus pterophori* Ashm., *Eurytoma tyloderma* Ashm., *Chelonus fissus* Prov., *Bassus gibbosus* Say, and an undescribed species of *Orgilus*.

Control program for 1927, L. A. STEARNS (*N. J. State Hort. Soc. Proc.*, 1926, pp. 71–88, *fig. 1*).—In this address on the oriental peach moth the author reports work conducted during 1926 under the headings of biological studies— influence of altitude and temperature on early seasonal development, 1926 infestation, and larval parasitism; and control studies, including hibernation quarters in relation to cultivation as a control measure, molasses as a bait for the adult moth, and insecticide tests, in continuation of work of the previous year (*El. S. R.*, 57, p. 756).

The preliminary studies of the influence of environmental factors on the seasonal life cycle of this insect indicate that local differences in brood conditions have their origin in the spring and in known variances in altitude and temperature, thus establishing the applicability throughout the entire State of the detailed biological studies conducted at New Brunswick during 1924 and 1925, with adequate adjustments based on present knowledge of the accelerating or retarding effect of these factors. The infestation of 1926 was an increase of approximately 10 per cent over that of 1925, with injury in northern New Jersey about 50 per cent as severe as that experienced in the more southern and more dense orchard areas. An analysis of comparative data on the extent of larval parasitism for the years 1925 and 1926 indicates an extension of parasitic activities approximately equaling those of the host. The continuance in the effectiveness of *Macrocentrus* and the increase and suggestion of still greater effectiveness of other parasites, especially *Glypta*, are encouraging.

A study of the hibernation quarters, although disclosing the fact that cultivation and the paradichlorobenzene treatment should destroy a high percentage (86 per cent) of the hibernating oriental peach moth, indicates an overwintering population in the upper portions of the tree sufficiently large (14 per cent) to constitute a continuance of infestation from year to year in spite of the thorough application of these measures. Knowledge, however, of the relatively unprotected character and location of these remaining hibernacula suggests the advisability of future studies with insecticides of a penetrating nature, with the attendant possibility of placing the control of the insect largely, if not wholly, within the dormant period. A continuance of the study of factors influencing the response of adult moths to baits included a test with molasses bait, which demonstrated its ineffectiveness in reducing fruit infestation and its prohibitive cost in practice when operated in accordance with present knowledge of optimum conditions determining maximum catch.

The results of laboratory tests with insecticides indicate that the efficiency of nicotine, Black Leaf 40, has been considerably underestimated in the past. Employed at the 1: 800 dilution, it showed an efficiency of 67 per cent as a combined ovicide and larvicide, only exceeded by a 2 per cent Volck, a highly refined colorless oil emulsion, which similarly employed showed an efficiency of 90 per cent. The possibility of foliage injury and its greater cost, together with the added expense of separate applications on account of its incompatibility with sulfur sprays, make its substitution for the nicotine questionable. These results, in common with those which show that a considerable number of insecticides under controlled conditions reduce entry into fruit from 10 to 25 per cent, are suggestive for future study.

In the discussion of the paper which follows, an account of the occurrence and importance of the pest in the United States at large is given by A. Peterson.

An operation in practical control of codling moth in a heavily infested district, T. J. HEADLEE (*N. J. State Hort. Soc. Proc.*, 1926, pp. 89-110).—This is an account of cooperative control work conducted by a group of apple growers in the Glasboro district under the direction of the author, reference to which has been made in the report previously noted (*E. S. R.*, 57, p. 755). Data relating to the work, including the yield of fruit free from codling moth, are presented in tabular form. The author concludes that under New Jersey conditions, where the codling moth is sufficiently abundant to infest 100 per cent of the unsprayed late fruit, it can be brought under control by careful and thorough application of the knowledge already available.

In the discussion which follows (pp. 100-110) information is given on the control of the European red mite by spraying oils, information on the control of the San Jose scale, leafhoppers, peach tree borer, and leopard moth. The last-named pest is threatening apple trees in the State, some of the worst infestations having been observed in Monmouth County. As many as 10 to 12 2½-year-old leopard moth larvae have been taken from young apple trees by the author in a year. The discussion also includes information by L. A. Stearns on the oriental peach moth, an address on which is noted above.

A review of the present situation regarding tea tortrix in Ceylon, S. S. LIGHT (*Trop. Agr. [Ceylon]*, 68 (1927), No. 6, pp. 349-362).—A general summary of the present situation in Ceylon.

The resistance of Anopheles eggs to desiccation, B. S. CHALAM (*Indian Jour. Med. Research*, 14 (1927), No. 4, pp. 863-866).—Eggs of *A. subpictus* and *A. stephensi* were found by the author to be viable after desiccation up to a period of 12 days, hatching normally and some growing to maturity.

Investigations on sheep blowflies, W. B. GURNEY and A. R. WOODHILL (*N. S. Wales Dept. Agr., Sci. Bul.* 27 (1926), pp. 28, figs. 12).—The first part of this report (pp. 3-19) deals with range of flight and longevity, and the second part (pp. 20-28) with notes on bionomics and parasites. The data obtained disclose the actual range of flight of blowflies as being at least 10 miles, and prove that a single carcass is capable of infesting a tract of country 20 miles in diameter, or 314 square miles in area. The blowfly *Chrysomya albiceps* can travel a distance of at least 10 miles within 12 days from the date of liberation; other species 8 miles within 17 days; and all the species used in the experiment 4 miles within 12 to 16 days.

A sarcophagid parasite of solitary wasps: *Pachyophthalmus* parasitising *Ancistrocerus*, J. G. MYERS (*Ent. Mo. Mag.*, 3. ser., 13 (1927), Nos. 152, pp. 190-192; 153, pp. 193-196).—The author reports observations made at Forest Hills, Mass., of the parasitism of *A. catskillensis* (Sauss.) by *P. signatus* (Meig.).

The orange maggot, *Anastrepha ludens* Loew, F. L. THOMAS (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 544, 545).—The author reports the discovery in April, 1927, of this pest in the principal citrus growing region of Texas.

A systematic index to the keys for the determination of the Nearctic Coleoptera, M. H. HATCH (*Jour. N. Y. Ent. Soc.*, 35 (1927), No. 3, pp. 279-306).—In addition to an index to keys of Nearctic Coleoptera a supplementary bibliography of four pages is included.

The relation of highway slash to infestations by the western pine beetle in standing timber, J. E. PATTERSON (*U. S. Dept. Agr., Tech. Bul.* 3 (1927), pp. 10, figs. 3).—The data here presented have been noted from another source (*E. S. R.*, 56, p. 860).

The work of the State apicultural research laboratory, 1919-1926, H. B. PARKS (*Texas Sta. Bul.* 361 (1927), pp. 16, figs. 4).—This is an account of the work conducted at the State apicultural laboratory located near San

Antonio, including a discussion of weather conditions, bee pasturage, winter care of bees, improvement of stock, etc.

Demonstration of instrumental insemination of the queenbee, L. R. WATSON (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 530-536).—The author reports upon a method of instrumental insemination in which about 50 per cent of all treated queen bees later showed insemination ranging all the way from perfectly normal down to very slight.

The relative sensitivity of honeybees to light of different wave-lengths, L. M. BERTHOLF (*Jour. Econ. Ent.*, 20 (1927), No. 3, p. 521).—This is an abstract of a paper presented by the author at the annual meeting of the American Association of Economic Entomologists. The experiments showed that red does not stimulate bees as much as it does humans, but that violet stimulates them more.

Gaseous chlorine as a disinfectant for American foulbrood infected combs, R. HUTSON (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 516-520).—In this contribution from the New Jersey Experiment Stations the author reports that gaseous chlorine, commonly used as a water purifier, killed *Bacillus larvae* in a period of 48 hours, as was demonstrated by culture and field experiments. It is pointed out that the treatment of infected combs with this gas reduces labor costs, but has the disadvantages, as used, of injury to frames, and where honey is present of injury to bees.

Do daily egg-laying rates of less than 3,000 found by recent investigators indicate average queenbees? W. J. NOLAN (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 501-507).—The author points out that a daily gain of 20 to 25 lbs. of honey during the honey flow is high for any colony of honey bees. Scientific data as to average nectar loads, number of trips per day, and the amount of water eliminated from nectar after it is brought into the hive indicate that a queen bee having an average daily egg-laying rate of less than 3,000 can produce enough workers to gather an excess of 25 lbs. of nectar during any one day. Consequently, recent scientific brood-rearing investigations have been made on colonies having average queen bees, even though none of the latter were found to lay over 3,000 eggs in 24 hours.

Studies on the evaporation of nectar, O. W. PARK (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 510-516).—This is a contribution from the Iowa Experiment Station.

The results of recent experiments by the author indicate that no concentration of nectar occurs within the body of the bee between the flower and the hive entrance, but that evaporation in its several phases as carried on within the hive is sufficient to account fully for the observed rate of nectar concentration.

The fertilization and hibernation of queen bumblebees under controlled conditions, T. H. FRISON (*Jour. Econ. Ent.*, 20 (1927), No. 3, pp. 522-526).—This account relates to experiments on fertilization and hibernation of queen bumblebees during the years 1916, 1917, 1919, and 1920. The results show that the fertilization and hibernation of certain species of queen bumblebees can be obtained under controlled conditions.

European hornet girdling shrubs, E. P. FELT (*Tree Talk*, 8 (1926), No. 1, pp. 11, 12, figs. 2).—A brief account of the importance of an imported hornet, first observed in the vicinity of New York City some 30 years ago, which is now rather generally distributed within a radius of 100 miles. This hornet occasionally attracts notice because of its stripping the bark from young stems of a variety of trees and shrubs, including the alder, linden, lilac, various willows, poplar, horse chestnut, larch, oak, and rhododendron.

Galls on stems of cultivated blueberry (*Vaccinium corymbosum*) caused by a chalcidoid, *Hemadas nubilipennis* Ashm., B. F. DRIGGERS (*Jour. N. Y.*

Ent. Soc., 35 (1927), No. 3, pp. 253-259).—In this contribution from the New Jersey Experiment Stations the author reports that *H. nubilipennis* has become so numerous that control measures are necessary. In control experiments in which separate sets of blueberry plants were exposed to the different species of chalcidoids, it was found that *H. nubilipennis* is capable of forming the reniform, pithy galls commonly ascribed to *Solenozopheria vaccinii* Ashm.

ANIMAL PRODUCTION

Waste pimiento pepper for coloring egg yolks, W. A. MORGAN and J. G. WOODBROOK (*Georgia Sta. Bul.* 147 (1927), pp. 209-215, pls. 2).—This is a more detailed account of work previously noted (E. S. R., 57, p. 269). Ripe pimiento peppers were dried, ground, and fed at the rate of 0.5 gm. per hen per day. Eggs were examined in glass dishes. Color first appeared in the yolks five days after the start of feeding. From the fifth to the tenth day there was a wide variation in the color, but after that time the color became uniform. The white remained unchanged, and the color of the shell changed but little. The keeping, cooking, and candling qualities of the eggs were unchanged except as to the color of the yolk by feeding peppers.

Report on inspection of commercial feeding stuffs, 1926-1927, E. M. BAILEY ET AL. (*Connecticut State Sta. Bul.* 289 (1927), pp. 487-576+XVIII).—This is the usual report of the guaranteed and found analyses of feeds officially inspected from September 1, 1926, to August 31, 1927 (E. S. R., 55, p. 358).

Composition and cost of commercial feeding stuffs in 1926, A. W. CLARK ET AL. (*New York State Sta. Bul.* 545 (1927), pp. 40).—A summary of the general nature of the different classes of feeding stuffs, together with the average composition, average selling price, and the cost per pound of protein and fat of samples taken between July 1, 1926, and January 1, 1927.

The influence of ultra-violet light upon the growth of animals, K. SUZUKI and T. HATANO (*Imp. Acad. [Japan]. Proc.*, 3 (1927), No. 2, pp. 94-96).—Young rats, chickens, and rabbits were exposed at a distance of 40 cm. to irradiation from a quartz mercury vapor lamp at the Imperial Zootechnical Experiment Station, Chiba, and compared with check groups receiving no ultra-violet light. Adequate rations were supplied to each class of livestock. In every case the irradiated animals outgrew the controls. None of the control rats died during the experiment, but two chicks and one rabbit in these groups died from malnutrition.

Meat animals and their fat: How feeding influences size, shape, and content of bodies, J. L. LUSH (*Cattleman*, 13 (1927), No. 10, pp. 89, 91, 93).—Body measurements were made on 13 groups of steers at the Spur Substation, Texas, before fattening and again after fattening, to study the relation of body shape to rate of gain, to dressing percentage, and to the value of the dressed meat. The figures given are only approximate, since some of the animals measured were calves, some yearlings, and two groups were nearly 3 years old when finished.

All measurements increased at least a small amount during fattening, but some increased at the same rate as the steer's weight, some increased faster, and others slower. The width of chest, loin, heart and flank girths, body circumference at the largest part, and width at hooks increased at a faster rate than body weight, the percentage over increase in weight ranging from +10.8 in the first down to +0.1 in the last measurement. The width at the hip joints increased in proportion to the increase in live weight. Depth of chest, length of pelvis and of body from shoulder point to pin bones, circumference of cannon

the twins are of different sex, the male twin weighs more than the female when both twins are of the same sex. Male twin lambs are inferior in weight to male lambs of single birth. The percentage of sheep which are sterile or abort is 3.24, and the percentage of deaths 6.02. The male Zigaya lambs have the same weight as exceptional Merinos.

Lambs: Saving a larger harvest, C. M. HUBBARD (*Wash. State Col. Ext. Bul. 143* (1927), pp. 14, figs. 5).—The author discusses preparations for lambing, care at lambing, feeding and management after lambing, and troubles that may occur at lambing time, with the idea of saving the greater proportion of lambs born.

The physiological effect of feeding rations of Canadian peas on growth and reproduction in swine, J. E. NORDBY and R. S. SNYDER (*Idaho Sta. Circ. 48* (1927), pp. 8).—Continuing the work with Canadian field peas (E. S. R., 57, p. 765), an experiment was planned to study their effect upon growth and reproduction. The work reported is divided into two parts. Part 1 deals with the effect upon gilts and part 2 with the effect upon the same sows as two-year-olds.

In part 1, 12 March gilts were divided into three groups in such a manner that each lot contained litter mates. The experiment was started October 31, 1923, and the following rations were fed: Lot 1, cracked peas 150 parts, rolled barley 100, rolled oats 100, cracked yellow corn 100, rolled wheat 100, and ground alfalfa hay; lot 2, cracked peas 100, rolled barley 200 parts, and ground alfalfa hay; and lot 3, cracked peas. The gilts were bred at the first heat period after the start of the experiment. After farrowing the sows received a standard brood sow ration.

The second part of the experiment began October 15, 1924. Two lots were used in this part, consisting of 3 sows per lot, selected from the preceding test. The rations used were similar to those used in lots 2 and 3 mentioned above.

There was a tendency for the sows fed peas alone to go off feed. These sows gained slower and required more feed per unit of gain than did the other lots. In one case a sow receiving peas alone developed paralysis two weeks prior to farrowing. The greater proportion of the pigs in the check lots weighed between 2 and 3.5 lbs. at birth, while most of the pigs in the pea lots weighed between 1.5 and 2.5 lbs. When rated according to vigor most of the pigs in the check lots graded between "strong" and "very strong," while in the pea lots they graded from "fair" to "strong." With the gilts, 10.3 per cent, and with the sows 5.88 per cent of the pigs were born dead in the pea lots. No pigs were dead at birth in the other lots. This work indicates that peas do not contain the proper nutrients for pigs in utero.

Range for pork production (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 22, 23*).—Clean ground was found more satisfactory for the farrowing and raising of pigs than old piggy grounds. Pigs on new ground made faster growth and had less sickness and fewer worms, and the sows raised more pigs per litter than those on old ground.

Soft pork investigations, G. S. TEMPLETON (*Mississippi Sta. Rpt. 1926, pp. 9, 10*).—Three lots of 8 pigs each, averaging 186 lbs. each at the start, were fed for 112 days in continuance of work previously noted (E. S. R., 55, p. 667). During an initial or softening period of 56 days, all lots received tankage, and in addition lot 1 was fed corn, lot 2 rice polish, and lot 3 rice bran. The average daily gains per head in the respective lots were 1.99, 2.18, and 1.77 lbs. During a second 56-day period, or finishing period, all lots received corn and tankage. The average daily gains during this time were 1.68, 1.65, and 2.05 lbs., respectively. For pigs of this weight the rice by-product rations proved satisfactory.

Pig carcasses for Wiltshire bacon, H. R. DAVIDSON and J. ANDREASEN (*Jour. Min. Agr. [Gt. Brit.], 53 (1927), No. 12, pp. 1095-1102, pls. 7, fig. 1*).—The authors describe in detail, assisted by photographic views, slides and cuts that will assist breeders of bacon hogs in breeding the type the packers desire for the production of Wiltshire bacon. Working backward from the demand by consumers, they illustrate what is needed in the live hog to meet this requirement.

Rations for work mules, G. S. TEMPLETON (*Mississippi Sta. Rpt. 1926, p. 7*).—Continuing this study with mules (E. S. R., 55, p. 669), a comparison was made between Johnson grass hay and a good quality soy bean hay when fed with ear corn and between stall feeding and lot feeding. Four lots of mules were used in the test, each lot receiving 13.7 lbs. of ear corn except lot 4 which received 15.19 lbs. Lots 1 and 3 received 12 lbs. of Johnson grass hay, lot 2 11 lbs. of soy bean hay, and lot 4 12.38 lbs. of Johnson grass hay. Lot 3 was stall fed and lot 4 lot fed.

In this work 11 lbs. of soy bean hay was equal to 12 lbs. of Johnson grass hay. Observations showed no difference in the ability of the mules fed the various rations to work and to withstand heat. All rations proved satisfactory for maintaining body weight.

[Experiments with poultry at the Kentucky Station] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 20, 21*).—A comparison of calcium carbonate, calcium sulfate, tricalcium phosphate, calcium lactate, and calcium chloride as carriers of calcium for laying hens on a ration of wheat, corn, and skim milk showed that calcium carbonate was more favorable to metabolism, judged by the number of eggs produced, average weight of egg content, average weight of shell, and the thriftiness of the birds, than any of the other compounds tried.

Chickens raised to maturity without grit (E. S. R., 56, p. 166) were equal in every way to a similar lot grown out under usual conditions.

Tests with condensed and granulated buttermilk did not indicate a need for a milk supplement for high egg production. One year's results indicated that 2.5 per cent of meat scrap in the mash was sufficient when skim milk is available in large amounts for laying hens.

[Poultry investigations at the Mississippi Station], E. P. CLAYTON (*Mississippi Sta. Rpt. 1926, pp. 22, 23*).—Continuing the work with poultry (E. S. R., 55, p. 669), it was found in one year's test that pedigreed pullets produced 8.33 per cent more eggs than pullets of unknown ability.

Of 96 pens of pullets, the 10 leading pens averaged 58 eggs per pullet during the four winter months and 208 eggs per bird for the year. The 10 lowest pens averaged 23 eggs per pullet during the winter and 98 eggs for the year. The respective average winter production was 28 and 24 per cent of the total, or for all hens 27 per cent. The heavy and light breeds averaged about the same percentage of eggs during the winter months. From these records it was found that multiplying the winter production by 3.7 gave approximately the yearly production.

A combination of beef scrap (12.5 per cent of mash), and cottonseed meal (12.5 per cent of mash) has produced more eggs during 1924 and 1925 than any other protein or a combination with lime added.

The increase in the calcium of hens' blood accompanying egg production, J. S. HUGHES, R. W. TITUS, and B. L. SMITH (*Science, 65 (1927), No. 1680, p. 264*).—In connection with the work previously noted (E. S. R., 54, p. 670), it was found that the calcium content of the blood of a large number of normally laying hens varied greatly. In a lot of 10 hens there were found values ranging from 18 mg. per 100 cc. of blood to 32 mg. per 10 cc. Further

work was conducted with the blood of chickens ranging in age from 1 day to 18 months.

From birth up to the time of laying the average calcium content of blood ranged from 12 to 14 mg. per 100 cc. Mature pullets not in production had an average of 20 mg., while pullets of the same age in production had an average of 27 mg. Capons, mature cockerels, and molting hens not in production had a calcium content little or no higher than immature birds, while mature hens after molting and in production averaged 31 mg. of calcium per 100 cc. The authors believe that this increase in calcium content of the blood is due to the work of the hormones that produce secondary sexual characteristics.

Feeding market egg layers for winter production, MR. and MRS. G. R. SHOUP (*Western Washington Sta. Pop. Bul. 3-W (1926)*, pp. 8).—The practices of winter feeding, the proper feeding stuffs, and the special uses of various feeds are described by the authors. Careful directions are given for handling the birds at this time to keep laying at the peak.

Better rations—more eggs, F. E. MUSSEHL (*Nebr. Agr. Col. Ext. Circ. 1420, rev. (1927)*, pp. 15, figs. 4).—A revision of work previously noted (E. S. R., 54, p. 766).

Hatching and rearing chicks, L. P. GARDNER (*Maine Agr. Col. Ext. Bul. 167 (1927)*, pp. 16, figs. 4).—A popular presentation of the methods and management for hatching and rearing chicks. Rations are suggested for use at different times in the life of a chick.

From baby chicks to finished pullets, MRS. G. R. SHOUP (*Western Washington Sta. Pop. Bul. 1-W (1927)*, pp. 15, figs. 3).—The author describes the work of rearing baby chicks to laying pullets. Tables give the routine of work with 1,000 chicks from the fourth to the tenth day, from the eleventh day to nine weeks of age, and from 9 to 18 weeks of age. Rations used at different periods in the growth of the chicks are suggested.

DAIRY FARMING—DAIRYING

Value of pasture [for dairy cows], J. S. MOORE (*Mississippi Sta. Rpt. 1926*, p. 11).—Results of two years' study (E. S. R., 55, p. 673) show that good pasture furnishes sufficient nutrients for maintenance and for the production of 14 lbs. of 4 per cent milk. In addition the cows gained during the test an average of 125 lbs. live weight. The pasture season was 168 days for 5 cows in 1924 and 161 days for 4 cows in 1925.

Coffee bran v. wheat bran [trans. title] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926, Spanish ed.*, p. 54).—Two groups of cows were fed 28 days by the reversal method on similar rations except that one contained wheat bran and the other coffee bran. The cows fed coffee bran ate 56 lbs. more feed and produced 64.2 lbs. less milk during the test than those fed wheat bran.

The immediate influence of feeds upon the quantity and quality of cow's milk.—I, The effect of ground flax, W. E. PETERSEN (*Jour. Dairy Sci.*, 10 (1927), No. 1, pp. 70–82, figs. 4; *abs. in Internatl. Rev. Agr. [Rome]*, n. ser., 18 (1927), No. 4, pp. 456, 457 (224T, 225T)).—Cows at the Minnesota Experiment Station were fed flaxseed for 48 hours immediately following the regular official inspection period. Changes in the quantity and quality of the milk produced were noted.

The response to ground flax feeding differed with individuals. When fed at the rate of 3 lbs. daily, the average increase in fat was 2.9 per cent, ranging from 0 to 7.1 per cent. Flax also caused, in the majority of cases, an average increase of 1.1 per cent in the amount of milk produced. Cows that responded

to flax feeding were uniform in their response from month to month throughout the year. The response to such feeding was almost immediate, appearing in most cases 8 hours after the initial feed.

Effect of some succulent feeds on the flavor and odor of milk, C. J. BARCOCK (*U. S. Dept. Agr., Tech. Bul. 9* (1927), pp. 7).—Four groups of 4 cows each were fed a basal ration of grain and alfalfa hay at the dairy experiment farm at Beltsville, Md. In addition, three of the groups were fed succulents in the following quantities: 15 lbs. 1 hour before milking, 30 lbs. 1 hour before milking, and 30 lbs. immediately after milking. Samples of milk were taken from each cow, and flavors and odors thought to be due to feeding were classified as very slightly off, slightly off, and off. If no flavor or odor appeared the samples were graded normal. The feeds used to determine their effect on the flavor and odor of milk were dried beet pulp, green oats and peas, pumpkins, carrots, sugar beets, rape, soy beans, and thousand-headed kale.

When fed after milking none of these feeds had any noticeable effect upon the flavor or odor of milk. When fed in amounts up to 30 lbs. before milking, pumpkins and sugar beets had no apparent effect; dried beet pulp, green oats and peas, and carrots produced slightly abnormal effects; rape and kale had decidedly abnormal effects; and soy beans tended to improve the flavor and odor of milk.

The National Institute for Research in Dairying annual report, 1926 (*Natl. Inst. Research Dairying [Reading] Ann. Rpt. 1926*, pp. 59, pl. 1, figs. 3).—The annual report (E. S. R., 55, p. 869) for the year ended July 21, 1926, gives a general account of the institute, and includes progress reports of experimental work concerning the feeding and nutrition of dairy cattle, the chemical properties and bacteriological content of milk, and problems of dairy manufacture.

Treatment of parchment paper used for wrapping butter, H. MACY (*Creamery and Milk Plant Mo.*, 16 (1927), No. 5, pp. 38, 40).—Parchment paper that had been exposed to dust and contamination has been shown to be a source of mold on butter at the Minnesota Experiment Station. Butter produced under aseptic conditions was wrapped in contaminated and sterilized paper. Part of the butter was stored at 55° F. and the remainder at 40°. Some of the samples were stored in humidors in which the atmosphere was saturated with moisture and the air stagnant. No molds appeared even after 90 days' storage on any of the samples wrapped in the treated parchment. With the contaminated parchment molds appeared in from 48 to 70 days at 55° and in from 60 to 90 days at 40°.

Various chemicals have been tried for the treatment of parchment paper, but besides the expense there are objections to all of them. The author recommends that the paper be placed in a container filled with water in such a manner that the water touches all the surfaces, and then boiled for 10 minutes. Three to 5 lbs. of salt, to each gallon of water may be added if desired. Allow the paper to remain in the container until used the following day. The author also recommends that parchment paper be allowed to remain in the original cartons as long as possible, and that the room in which it is stored be kept dry and well ventilated.

The cheese industry, M. BEAU and C. BOUGAIN (*L'Industrie Fromagère. Paris: J.-B. Baillière & Sons, 1926*, pp. 218, figs. [14]).—This treatise gives a brief history of the development of the cheese industry. The physical and chemical properties of the curd and the processes of making and ripening cheeses are discussed.

The relation of butterfat to quality and overrun in ice cream, P. S. LUCAS (*Ice Cream Rev.*, 10 (1927), No. 12, pp. 41, 142, 144).—Batches of ice

cream containing 8, 10, 12, and 14 per cent fat each and 8 per cent milk solids not fat were pasteurized, viscollized, and aged in the same manner at the Michigan Experiment Station. The batches were frozen and samples taken at about 90 per cent swell. A pint sample was held for scoring and a quart brick taken for the melting test. In scoring, 50 points were allowed as a perfect score for flavor and 25 points for body texture.

An increase in fat hastened the time in which the maximum amount of air is whipped into the cream. This factor is, however, so slight as to be of no commercial value. It was found that each 2 per cent increase in fat decreased overrun approximately 10 per cent. The average scores for flavor for the 8, 10, 12, and 14 per cent ice creams were 34.7, 36.8, 39.7, and 42.9 points, which the author believes to be representative of the average taste for such ice cream. Vanilla flavor was more predominant in the low fat ice creams. Little change was noticed in the creams when scored 1 to 3 weeks later. Each 1 per cent increase in fat raised the score on body and texture approximately 1 point. The scores for the respective creams were 16.1, 18, 20.7, and 22.3 points. The 8 per cent ice cream was somewhat grainy, and this increased with storage, dropping the score from 18.6 to 15.2. The 10 per cent product decreased somewhat in quality with storage, but the 12 and 14 per cent products were not affected to any great extent. In the melting tests the bricks were placed on a screen in a room at 80° F. After 3.5 hours' exposure there was left on the screen 6, 6.4, 8.8, and 11.8 oz., respectively, of the various bricks.

Since the milk solids not fat may be utilized to some extent to replace butterfat, mixes were made containing 6, 8, 10, and 12 per cent serum solids and 10 per cent fat, and tests conducted as above. After aging, the 6 per cent mix offered little resistance to stirring, while the 12 per cent mix was very thick and heavy. The serum solids had the same effect upon swell as the fat. The scores for body in the respective mixtures were 15.7, 19.5, 22.2, and 22.7 points. There is danger of sandiness in storing 12 per cent serum salt mixtures. The 10 per cent stored perfectly, while the 6 and 8 per cent became coarse very rapidly. When the melting test was applied as above, 4.1, 3.5, 3.8, and 3.8 oz., respectively, of these mixtures passed through the screen. The author believes that 10 to 10.5 per cent milk solids not fat is the optimum for 10 per cent fat mixtures.

Butterfat influences the flavor, body, and storage properties of ice cream.

The basic viscosity of ice cream mixes, A. LEIGHTON and O. E. WILLIAMS (*Ice Cream Rev.*, 10 (1927), No. 12, pp. 113, 114, 116, fig. 1).—In this study of viscosity, an unflavored mix of unsweetened evaporated milk, cream, cane sugar, and water, with the addition of a small amount of gelatin, was prepared in the ice cream laboratory of the U. S. D. A. Bureau of Dairy Industry. The mix was pasteurized at 63° C. for 30 minutes, homogenized at 2,500 lbs. pressure while still hot, cooled immediately, and then stored for 1 day at 2°.

Its viscosity when freshly prepared, measured at 0°, was 9.11 centipoises. The following day its apparent viscosity was less than 50 centipoises. A portion of the mix was put in a freezer until it completely filled the space, so that no air could be incorporated. When the mix had reached 0° the dasher was started at 175 r. p. m. At 5-minute intervals samples were taken and their viscosity determined. The viscosity was found to be constant for this period at 36.31 centipoises. This value was checked by placing portions of the mix in flasks and shaking, and again checked when samples were stirred rapidly. The determination of viscosity of mixes of different relative fat, milk solids not fat, and sugar content showed that there was a definite relation between the logarithm of the viscosity and the concentration of the mix. Additional ex-

periments have shown that the basic viscosity does not change after the initial change even after standing for 1 week at 5°, though there is a marked increase in the apparent viscosity.

This work shows the existence of a measurable basic viscosity of ice cream mixes. The change of value in this basic viscosity follows the Arrhenius equation, which is $\log \eta = Oc + k$, in which η is the viscosity, c the concentration, O a constant, and k a constant which theoretically should equal the $\log 1.796$, the viscosity of water at 0°.

A new health cream, E. MARK (*Ice Cream Rev.*, 10 (1927), No. 12, pp. 140, 142).—"Prune pulp," consisting of the screened flesh of soaked prunes free from pits and practically free from skins, is being used as a flavor for ice cream (E. S. R., 57, p. 276). Prune pulp has the characteristic prune flavor, odor, and color. The texture of this product is smooth and in consistency and appearance resembles that of a fruit butter.

It is recommended that 14 lbs. of prune pulp be added to 45 lbs. of ice cream mix, either unflavored or flavored with vanilla and containing 10.5 per cent butterfat. This produces a finished product containing 8 per cent fat and 23.7 per cent prune pulp. In order to eliminate any trouble that might arise from adding the pulp directly to the mix in the freezer, it is recommended that the pulp be added to a gallon of mix and then incorporated in the freezer.

Heller's guide for ice-cream makers (Chicago: B. Heller & Co., 1927, 7. ed., rev., pp. 416, figs. 54).—A practical treatise dealing with the various phases of the ice cream business, such as formulas for standard, fancy ice creams, ices, and sherbets. Methods of manufacture and defects and remedies for such in the product are discussed.

VETERINARY MEDICINE

[Work in animal pathology at the Kentucky Station] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 20, 21, 22*).—In a comparison made of the agglutination and intradermal tests for the detection of bacillary white diarrhea, 653 birds in 5 flocks were tested. Of this number, 147 birds, or 22.3 per cent, reacted to the agglutination test, and of these 70, or 47.6 per cent, reacted to pullorin. Of 21 birds giving positive reaction to the agglutination test and negative reaction to the intradermal test, *Bacterium pullorum* was recovered from 19 on post-mortem examination. It was not recovered from any of the 17 birds giving positive pullorin tests and negative agglutination tests. It is pointed out that the pullorin used was a commercial product.

In a comparative study of the encapsulated organisms isolated from cases of metritis in mares and encapsulated organisms from other sources, 25 strains of equine origin were studied and found to be identical in their morphological, cultural, biochemical, and serological properties. Cultures of Friedlander's and granuloma bacilli were found to vary markedly, little uniformity being demonstrable in these groups. It is pointed out that recent work has shown Friedlander's bacilli to be divisible into four types on the basis of serological tests. Cultures recovered from mares were found to be identical with one of these types.

Post-mortem examinations were made on 22 foals during the foaling season, of which 11 were found to be infected with *Bacterium viscosum equi*. It is stated that up until this time only 4 cases of this infection had been reported in the United States, these being from the station laboratory.

The bacterin treatment for infectious abortion was administered to 785 head of cattle on 29 farms, while 55 cattle on 7 farms received treatment in the

form of a vaccine. The results obtained in the treatment of the cattle for this disease are said to be encouraging. A bacterin made from *B. abortus-equinus* was administered to 1,565 mares on 52 farms. Investigations have shown a variation in the agglutination test for infectious abortion of cows when different strains of *B. abortus* (Bang) are used as antigen.

[Livestock diseases], J. LYONS (*New Zealand Dept. Agr. Ann. Rpt. 1925-26, pp. 11-13, 15, 16, 17, 18*).—The occurrence of infectious and parasitic diseases of livestock and work therewith are reported upon.

Administration report of the Government veterinary surgeon for 1926, G. W. STUBGEES (*Ceylon Govt. Vet. Surg. Rpt. 1926, pp. 12, pls. 4*).—This report includes an account of the occurrence of infectious diseases of livestock in Ceylon and control work conducted, particularly as relates to rinderpest, and continues earlier work (*E. S. R.*, 55, p. 677).

A check-list and host-list of the external parasites found on South African Mammalia, Aves, and Reptilia, G. A. H. BEDFORD (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11-12, pt. 1 (1926), pp. 703-817*).—This consists of an annotated check list and host lists (pp. 784-813) of the parasites of South African animals, including tables for the separation of genera and species. A list of references is included.

Further observations on foot and mouth disease, Sects. D-F, S. P. BEDSON ET AL. (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 2, pp. 79-117).—This continuation of studies previously noted (*E. S. R.*, 57, p. 470) includes three contributions.

Experiments on the cultivation of the virus of foot and mouth disease, S. P. Bedson and H. B. Maitland (pp. 79-93).—The authors found that the period of survival of the virus of foot-and-mouth disease in phosphate pH 7.6 at 37° C. was not affected by the addition to the phosphate of an equal volume of 2 per cent peptone in water, digest broth, or 1 per cent glucose broth. Similarly, 15 per cent to 35 per cent of citrated guinea pig plasma, or 25 per cent of extract of guinea pig embryos in phosphate pH 7.6, did not affect survival as compared with phosphate alone. When virus was incubated at 37° in serum of the guinea pig, rabbit, sheep, or horse, the period of survival was shortened. Diluted serum (5 to 50 per cent) in phosphate, which maintained the reaction of pH 7.6, had the same effect on survival as serum alone. Heating serum at 56° for 1 hour or at 65° for 30 minutes did not alter its deleterious effect, although the latter temperature markedly reduced its antitryptic value. The survival of virus in serum alone or mixed with phosphate and broth was prolonged by the addition of trypsin, guinea pig embryo tissues, adult guinea pig tissue, or cubes of sterile raw potato. The presence of tissues or potato did not further enhance the action of trypsin. The prolongation of survival of the virus in media containing serum which resulted from the addition of trypsin was thought to depend on the digestion of serum proteins. There appeared also to be an optimum beyond which further digestion of serum produced conditions less favorable to survival.

The factors of oxygen tension and incubation at various temperatures and for periods up to 6 weeks were investigated, but without discovering more favorable conditions for survival. Attempts at symbiosis of the virus with *Bacillus subtilis*, *B. coli*, and *Staphylococcus albus* did not lead to prolongation of the survival of the virus.

The part played by the serum in immunity to foot-and-mouth disease, H. B. Maitland and Y. M. Burbury (pp. 93-102).—The authors find that small amounts (0.25 cc.) of serum taken from recovered guinea pigs about 3 weeks after infection will passively immunize normal guinea pigs against the development

of generalized lesions following a primary vesicle on the plantar pad. Large amounts of immune guinea pig serum (4 cc.) conferred very little passive protection against the development of local lesions on the plantar pad after intradermal inoculation of living virus.

A method of estimating the value of serum by neutralization of virus in vitro is described. The serum of 5 normal guinea pigs was tested; 3 sera failed to neutralize in vitro 1 minimal infective dose (m. i. d.) of virus, and 2 sera neutralized 1 but not 5 m. i. d. Infection leads to a rapid increase in the power of the serum to neutralize virus in vitro. When the serum of 6 guinea pigs 3 weeks after the date of infection was tested, 5 neutralized 25 but not 125 m. i. d., and 1 neutralized 125 but not 625 m. i. d. Of the serums of 4 guinea pigs 3 to 4 months after the date of infection, 1 neutralized 5 but not 25 m. i. d., 2 neutralized 25 but not 125 m. i. d., and 1 neutralized 125 but not 625 m. i. d.

One dose of formalized vaccine and one noninfective dose of living virus did not cause a sufficient increase in the neutralizing value of the serum for it to be detected. After 2 doses of formalized vaccine and 1 noninfective dose of living virus the serum of guinea pigs showed a definite increase in neutralizing value. After immunization by formalized vaccine and several noninfective doses of living virus, the neutralizing value of the serum, when tested up to 10.5 weeks after the last immunizing injection, equaled that of the majority of recovered animals.

No appreciable deterioration occurred in the neutralizing value of sera after storage at $\pm 5^\circ$ for periods of 3 or 4 weeks.

The total globulin content of immune guinea pig serum was greater than that of normal serum. The increase represented an increase in both the euglobulin and pseudoglobulin fractions, but the greater part appeared to be in the euglobulin.

A suspension of globulin from normal guinea pig serum in finely divided particles had a marked capacity for adsorbing virus. Virus adsorbing on globulin did not infect guinea pigs when the suspension was inoculated intradermally into the plantar skin. The virus, however, was not killed; when it was set free by solution of the globulin particles it then produced infection.

The plurality of immunological types of foot-and-mouth disease, H. B. Maitland, Y. M. Burbury, and S. P. Bedson (pp. 103-117).—A comparison of the strains known as G. F. and Vallée A by several methods has shown that they are sufficiently distinct to be considered different immunological types. G. F. and Swedish I strains were also found to belong to two completely different immunological types, while the strains Vallée A and Swedish I were very nearly alike immunologically. The differences that appeared in some of the experiments are such as might be expected to exist in two strains of virus belonging to one type but differing only in the relative proportions of component antigens.

Infectious abortion of cattle, J. M. BUCK (*U. S. Dept. Agr., Farmers' Bul.* 1536 (1927), pp. 11-14, figs. 2).—This bulletin is a revision of and supersedes *Farmers' Bulletin* 790, by Eichhorn and Potter (*E. S. R.*, 36, p. 883).

Contagious abortion of cattle in China, C. S. GIBBS, C. KEN, and S. PIAO (*Lingnaam Agr. Rev.*, 4 (1927), No. 1, pp. 13-19).—The experience and investigations of the authors indicate that contagious abortion is being introduced into China by the importation of diseased foreign cattle.

[*Work with a hemorrhagic disease at the Nevada Station*] (*Nevada Sta. Rpt.* 1926, pp. 16, 17, 26, 27).—A brief historical review is given of work with the hemorrhagic disease of cattle, causing heavy losses in western Nevada, which has led to the isolation of the causative organism as reported by Vawter

and Records (E. S. R., 54, p. 677). A serum used to immunize against this disease appears to be of value, it having reduced the loss of the animals treated by fully 75 per cent.

The control of stomach worms in the goat, S. Piao and C. S. Gibbs (*Lingnaam Agr. Rev.*, 4 (1927), No. 1, pp. 20-26, pls. 3).—In work at Nanking over a period of 5 months the nicotine-copper sulfate mixture seemed to give absolute control, none of the goats having been found to become reinfected during this period.

Verminous broncho-pneumonia in the pig, due to *Metastrongylus apri*, with observations on the chloroform method of treatment, N. BISSER (*Welsh Jour. Agr.*, 3 (1927), pp. 277-284).—The author reports in detail upon 2 outbreaks of verminous bronchitis in the pig treated by the chloroform method. He considers this treatment remarkably effective provided the condition is recognized and the treatment adopted in time, namely, during the bronchitic stage before the condition has proceeded into the pneumonic.

Collected studies on hog cholera, L. M. RODERICK and A. F. SCHALK (*North Dakota Sta. Bul.* 210 (1927), pp. 24).—These studies deal with the minimal infective quantity of the hog cholera virus, changes in the virus in the hyperimmunization process, the fate of the virus in other animals, longevity of the virus, a dialyzing experiment, immunizing property of serum and virus mixtures, stability of the immune substances in protective serum, effect of electrolysis on the virus, precipitation of the virus, and chemical analysis of the blood in hog cholera.

The authors find that when the disease-producing property of hog cholera virus is diminished or destroyed, the antigenic and immunizing power is similarly reduced, this being apparent from the effect on the virus in both the immune homologous host and in heterologous hosts. The conclusion is likewise justified on the basis of the work to date on the attenuation of the virus. It was possible to produce hog cholera with 0.00002 cc. of virus serum. The virus, therefore, multiplies or increases in the susceptible hog in the course of the disease so that the disease is an infection rather than a toxemia.

Hog cholera virus, when mixed in the circulation of the hog in the process of hyperimmunization, rapidly undergoes a diminution in the character of its virulence. Attempts to attenuate the virus by passage through other animals have succeeded only in the destruction of that strain of virus. There is indication that the virus may grow to some extent in closely related species. Field work suggests that pigs may fail to develop a lasting immunity because of a virulent virus. It is possible that the invasiveness may decrease through the action of conditions as yet unexplained.

Proper storage maintained a limited number of samples of virus at a desirable degree of virulence for 60 days. The dialyzing membranes used retained the virus when water, salt solution, and Ringer's solution were used for dialysis. The membranes appeared permeable when equine and porcine sera were employed.

The mixing of serum and virus does not result in the attenuation of the virus. The suitability of such mixtures for active immunization requires an adequate dosage of serum and the presence of virulent virus. The substances with protective properties in immune sera are comparatively quite stable, biologic materials. The virus is precipitated from blood by Folin's method for the preparation of protein-free filtrates. The carbohydrate and nitrogenous metabolism in hog cholera show little alteration. The degree of nitrogenous retention found at times is explained by the nephrosis which seems to be the chief form of kidney injury in addition to the hemorrhage.

Some observations on "hog flu" and its seasonal prevalence in Iowa. C. N. McBRIDE (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 3, pp. 368-377, fig. 1).—The observations here reported relate to the possibility of cross-infection, cough as a prominent symptom, sudden onset, seasonal prevalence, importance of hygienic surroundings, and probability that the infection is not spread by fairs.

The diagnosis of septicemic diseases of swine by cultures of bone marrow [trans. title], J. VERGE and A. BOUFFANAIS (*Rev. Gén. Méd. Vét.*, 36 (1927), No. 427, pp. 369-380).—The authors conclude that the presence and persistence of microbes in pure culture in the bone marrow during the course of septicemic diseases of swine make possible the diagnosis of the morbid process and also the determination of meats suitable for consumption. The account concludes with a list of 33 references to the literature.

Investigations of *Stephanurus dentatus* (kidney worm) of hogs.—Preliminary report. A. L. SHEALY and D. A. SANDERS (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 3, pp. 361-367, figs. 6).—This is a contribution from the Florida Experiment Station upon studies of parasitic infestation of the hog by the kidney worm, one of the most destructive parasites among swine in the South. It ranks very close to the *Ascaris* in economic importance.

An apparent hereditary epithelial defect factor, the possible etiology of bursattee in horses. C. E. HOWELL and G. H. HAERT (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 3, pp. 347-360, figs. 2).—The authors present evidence to show that the prime etiological factor in summer sores is a genetic one, observations made by workers during the past century being considered to have substantiated this hypothesis.

Bacteriologic observations on periodic ophthalmia in horses.—Preliminary report. E. C. ROSENOW (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 3, pp. 378-383).—The results of preliminary experiments here reported indicate that this disease is probably hematogenous and not the result of local infection through the conjunctival mucous membrane, although its common presence in the lacrimal sac in affected animals may be interpreted as indicating the latter route. It is pointed out that the susceptibility of horses, as measured by intracutaneous injection of filtrates, varies within wide limits.

Bacillary white diarrhea in Belgium [trans. title], LEYNEN (*Ann. Méd. Vét.*, 72 (1927), No. 5, pp. 193-226, pls. 2).—The author reports upon studies of a disease of chicks which occurs throughout Belgium and which has for a number of years been responsible for a high mortality, particularly in the vicinity of Mechlin and Londerzeel, where there is an intensive poultry culture, sometimes 80 per cent, or even complete loss, resulting.

The author's studies, commenced in 1920, have dealt with the cultural characteristics of the organism, which he has found to be *Bacterium pullorum*, its detection, transmission, etc. He has never observed in Belgium an epidemic in the grown fowl caused by *B. sanguinarium*, although epidemics of fowl typhoid occur in the Netherlands and in France. He has isolated the organism from material received from Rumania, where an epidemic occurred. Only *B. pullorum* has been found in the carrier fowls, and its injection into noninfected grown fowls has failed to affect them.

The cycle of infection is described and illustrated, and an account is given of the technique of the agglutination test. A dilution of 1:50 with 24 hours' incubation has been found satisfactory in making the test. The contamination of the serum with *Bacillus subtilis* and other germs is considered to be the principal source of error. In a comparison made of eggs from an infected pen with eggs from a noninfected pen, as determined by the agglutination test, the

percentage of hatch was 55 per cent and the mortality 82 per cent from the pen of reactors and the hatch 100 per cent and the mortality 10 per cent from the pen of nonreactors.

In studying the possible rôle of the cock in the transmission of the disease, a reacting male placed for one hour daily in a pen with six nonreacting hens failed to transmit the infection, all 67 eggs laid being negative for *B. pullorum*. A post-mortem examination of the cock, however, failed to show lesions of the testes, and the organism could not be isolated. It is suggested that the cock may frequently become infected through contaminated food and give a positive reaction, and the agglutinins disappear when the ingestion of the organism stops. The author finds the cock to be more refractory than the hen to infection by cohabitation. In tests made in October, 1924, of 818 fowls, 3 per cent of the adult males, 54.57 per cent of the hens, 9.49 per cent of the cockerels, and 14.65 per cent of the pullets were found to react to the agglutination test. From none of 20 reacting cocks given post-mortem examination has *B. pullorum* been isolated.

In a study of transmission among grown fowls, 17 nonreacting yearling birds from a flock with a virulent type were placed with 6 reacting adults in June, 1925. When tested on December 11, a single bird was found to react.

The author concludes that the chick may contract the disease by contact with infected adults. In a flock with 60 per cent reactors and a resulting high mortality in the chicks, the author found 100 pullets that did not react to the agglutination test, 15 of which gave a positive reaction when retested.

The prevention and control work under way in Belgium is reported upon. The administration of an anti-*B. sanguinarum* serum to 75 chicks was of no value, nor was the subcutaneous injection of 1 cc. of a 5 per cent phenol or of resorcin. No benefit was obtained from the use of a bacteriophage prepared by De Bleeck. The author reports having attempted a cure of infected fowls through use of a gelatin culture, killed by heating to 60° C. for 20 minutes, given 0.5, 1, and 2 cc., respectively, at 10-day intervals, but with negative results as indicated by infected eggs. He concludes that none of the curative treatments applied are of any value.

The results of the experiments conducted are given in five appended tables.

A study of fowl paralysis (*neuro-lymphomatosis gallinarum*), A. M. PAPPENHEIMER, L. C. DUNN, and V. C. CONE (*Connecticut Storrs Sta. Bul.* 143 (1926), pp. 185-290, pls. 18, figs. 12).—This is an extended report of studies of this affection of the fowl commenced in 1924, presented under the headings of review of previous literature; clinical features of the disease; epidemiology; pathology; bacteriology; fowl paralysis, coccidiosis, and intestinal worms; experiments on transmissibility; and general discussion.

The authors conclude that fowl paralysis is a disease entity, with characteristic clinical and pathological features. It occurs in all parts of the United States, the Netherlands, Austria, and probably South America. It appears to be endemic in certain foci, and having once appeared the disease tends to persist through successive years. It occurs with about equal frequency in both sexes, and all common breeds may be affected.

Symptoms appear between the third and eighteenth month, typical clinical cases not having been observed outside of these limits. The conspicuous symptoms are (1) asymmetrical partial and progressive paralysis of wings and both legs, and rarely of neck muscles, and (2) occasional gray discoloration of iris, with blindness. Nutrition is usually preserved. The duration is variable; the outcome is usually fatal, but spontaneous recovery may rarely occur.

The principal pathological changes are found in the nervous system. In the peripheral nerves, the essential feature is an intense infiltration of lymphoid,

plasma cells, and large mononuclears. This is accompanied by a myelin degeneration in the more advanced lesions, but the cellular infiltrations appear to precede the degenerative changes. In brain and cord and meninges there are similar infiltrations, predominantly perivascular. Infiltrations of the iris with lymphoid and plasma cells are found in the cases showing gross discoloration of the iris. Visceral lymphomata, originating in the ovary, are associated in a certain percentage of the cases. Evidence is presented in favor of the view that this association is not accidental and that the lymphomata are a manifestation of the disease. Infiltrations of the spinal cord and brain, rarely of the peripheral nerves, are frequently present in birds showing no clinical symptoms. These are interpreted as mild cases of the same disease. No microorganisms have been demonstrated in the tissues or by cultural methods.

The disease is transmissible to other chickens by subdural or intramuscular injection of suspensions of the nervous tissue of paralyzed birds. Only a certain proportion, not over 25 per cent, of chickens develop the disease after inoculation. This is taken to indicate a widespread immunity, either natural or acquired in the course of the experiment. No relation has been found between paralysis and infestation with coccidia or intestinal worms.

The authors suggest the name neuro-lymphomatosis galinarum for the affection. A list is given of 35 references to the literature.

A hitherto unrecorded disease of fowls due to a filter-passing virus, T. M. DOYLE (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 2, pp. 144-169, figs. 9).—This is an account of investigations of a disease first observed in the spring of 1926 on a poultry farm near Newcastle-on-Tyne, which, although it bears many resemblances to fowl plague, appears to be a separate entity. It is described as an acute febrile, contagious disease of fowls which greatly resembles fowl plague, being caused by a filter-passing virus and characterized by difficulty in respiration and a high mortality. It can be differentiated from plague by the period of incubation, symptoms, and lesions.

Fowls immune to plague are susceptible to both artificial and natural infection with Newcastle disease, and fowls immune to Newcastle disease are susceptible to artificial and natural infection with plague. The virus is contained in the body fluids, organs, and excretions of affected birds. Filtration experiments have shown that the virus contained in the mouth exudate can pass through Berkefeld, Chamberland, and Seltz filters. Pigeons, both young and adults, can be easily infected with Newcastle disease, but are very resistant to infection with plague. The mortality in naturally infected flocks is usually about 100 per cent.

Poultry diseases in Washington, C. E. SAWYER and S. S. WORLEY (*Western Washington Sta. Pop. Bul.* 5-W (1927), pp. 52, figs. 22).—This is a practical summary of information on the important diseases and parasites of poultry met with in Washington, and remedial and control measures.

AGRICULTURAL ENGINEERING

Spray irrigation in the Eastern States, G. A. MITCHELL and F. E. STAERNER (*U. S. Dept. Agr., Farmers' Bul.* 1529 (1927), pp. 11+27, figs. 8).—Practical information on the subject is given. This relates particularly to symptoms of small or only moderate size, suitable for home gardens and fields up to four of five acres.

Public Roads, [August-September, 1927] (*U. S. Dept. Agr., Public Roads*, 8 (1927), Nos. 6, pp. 105-124+[2], figs. 14; 7, pp. 125-158+[2], figs. 34).—These numbers of this periodical contain the status of Federal-aid highway

construction as of July 31 and August 31, respectively, together with the articles following:

No. 6.—Protection of Concrete Against Alkali, by E. C. E. Lord (pp. 105–112, 119); Static and Impact Loads Transmitted to Culverts (pp. 113–119); Effect of Quality of Portland Cement upon the Strength of Concrete, by F. H. Jackson (pp. 120–122); Capping Square for Concrete Compressive Strength Specimens, by F. V. Beangel (p. 123); and New Research Projects Initiated by Bureau of Public Roads (p. 124).

No. 7.—Light Asphaltic Oil Road Surfaces, by C. L. McKesson and W. N. Frickstad.

Farm horseshoeing, H. ASMUS and J. O. WILLIAMS (*U. S. Dept. Agr., Farmers' Bul. 1535* (1927), pp. II+13, figs. 21).—Practical information is given.

The Puyallup laying house, MR. and MRS. G. R. SHOUP (*Western Washington Sta. Pop. Bul. 4-W* (1927), pp. 52, figs. 21).—Practical information on the planning and construction of laying houses adapted for Washington conditions is presented, together with working drawings.

Commercial brooder equipment and its operation, G. R. SHOUP (*Western Washington Sta. Pop. Bul. 2-W* (1927), pp. 18, figs. 9).—This equipment is described and illustrated, and working drawings and bills of material of different parts thereof are included.

RURAL ECONOMICS AND SOCIOLOGY

Industrial prosperity and the farmer, R. C. ENGBERG (*New York: Macmillan Co., 1927, pp. XIII+286, figs. 16*).—This volume, one of the series of the Institute of Economics, presents the results of a study made to determine the direct influence of the general business cycle upon agriculture. The factors influencing agricultural production, the prices of and demand for agricultural products, and the variations in farm expenses are analyzed, and more detailed studies made of the relations between business cycles and the price of cotton, the price of wheat, and the corn-hog industry. The conclusions are reached that business cycles have very little effect upon agriculture, that it is not worth while for farmers to attempt to adjust their production policies to changes in demand or costs predicated on business forecasts, and that the remedies suggested for business cycles will have but little effect in stabilizing agricultural production and prices.

Appendixes include correlations of agricultural prices, volume of production, and business activity, and the results of statistical studies of the relationship between the supply and price of farm products.

International Economic Conference.—Draft resolutions on agriculture adopted by the third commission on May 16th, 1927 ([*Geneva*]: *League of Nations*, 1927, pp. 6).—There are included general resolutions and special resolutions on agricultural cooperation; relations between agricultural cooperative societies and consumers' cooperative societies, agricultural credit, campaign against the diseases affecting plants and animals, agriculture in colonies, forestry, documentation on agricultural questions, statistics, and an inquiry regarding the economic, social, financial, and technical conditions of agriculture. The text is in French and English.

Agriculture and the International Economic Conference (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 4, pp. 307–315).—The resolutions noted above are given and commented upon briefly.

[Investigations in agricultural economics at the Kentucky Station, 1926] (*Kentucky Sta. Rpt. 1926, pt. 1, pp. 11–14*).—Studies not previously noted are included as follows:

The peak of receipts of Kentucky eggs on the New York market was found to be a little earlier than the peak of receipts from all sources. Receipts from poultry were found to form a higher percentage of gross receipts in Kentucky areas of low farm income than in areas of larger farm incomes.

Data on the yearly earnings on 952 farms in different sections of the State in 1915, 1916, and 1922-1924 showed that those of the more successful farmers exceeded those of the average farmers by from \$751 to \$2,593.

Analysis of data secured in a study of about 200 typical tenant farmers in Fayette and adjoining counties brought out the facts that the average age of tenants and years of tenancy were 42 and 13.4 years, respectively, that the average number of persons occupying the houses was 5.4, and that the average expenditure per family for groceries and clothing was \$313 and \$176, respectively. A large proportion of the tenants showed interest in churches, schools, lodges, and other community organizations.

A 4-year study including 27 wheat crops in Christian County showed the average yield to be 10.9 bu. per acre, with an average farm value of \$11.09. The cost of production, exclusive of land rent, on these farms averaged \$9.63 per acre.

From 18 to 49 hours, averaging 33 hours, of man labor, and from 33 to 75 hours, averaging 50 hours, of horse work were required in the production of one acre of corn on 19 farms in Graves, Calloway, and Marshall Counties in 1924. In 1925, from 25 to 35 hours, averaging 29 hours, of man labor, and from 36 to 68 hours, averaging 43 hours, of horse work were used.

The sources of net income, L. E. LONG (*Mississippi Sta. Circ.* 73 (1927), pp. 7).—Using records obtained in 1924 from 229 farms in Simpson, Jefferson Davis, Covington, and Jones Counties, comparisons between the averages for the 40 farms with the highest and the 40 farms with the lowest cash income are made of investments of different kinds, utilization of land, acreages of different crops, numbers of livestock kept, sales of crops and livestock, receipts and expenses, labor employed, fertilizer used, etc.

Land acquisition problems in relation to afforestation, A. C. FORBES (*[Irish Free State] Dept. Lands and Agr. Jour.*, 27 (1927), No. 1, pp. 1-11).—Some of the difficulties met in acquiring land in a thickly populated and settled country for afforestation are discussed. Tables are included showing the estimated costs per acre for fencing, roads, buildings, caretaking, and supervision for blocks of 50, 100, 500, and 1,000 acres, and the estimated annual yield and value of timber on lands of three different degrees of surface fertility.

Large-scale cotton production in Texas, L. P. GABBARD and F. R. JONES (*Texas Sta. Bul.* 362 (1927), pp. 24, figs. 12).—This study was made in cooperation with the Bureau of Agricultural Economics and Public Roads, U. S. D. A., to determine the influence of types of farm organization, power, and machinery, and the effect of different types of power and machinery on labor requirements for a large-scale production of cotton. The data were secured by personal interview from 52 farms, averaging 376 acres, in the Corpus Christi area, and from 48 farms, averaging 453 acres, in the San Angelo area of Texas. In each area schedules were obtained from three groups of farmers, those using horse power alone, those using tractors alone, and those using both horses and tractors.

The average cost of tractor work per hour was 77 cts. in the Corpus Christi area, and 68 cts. in the San Angelo area on tractor-operated farms, and 76 cts. in both areas on horse-tractor farms. The average cost of horse work per hour on horse-operated farms was 18 and 14 cts., respectively, and

on horse-tractor farms 25 and 15 cts., respectively, in the two areas. Up to picking, 10.3, 14.2, and 15.8 hours of man labor per acre were used, respectively, on tractor, horse, and horse-tractor operated farms in the Corpus Christi area, and 9.8, 14.8, and 8.8 hours, respectively, in the San Angelo area. The number of horses replaced by the tractor was found to vary from 5.21 in planting with a 2-row cultivator in the San Angelo area to 13.70 in cultivating with a 6-row cultivator in the Corpus Christi area.

On the basis of results found, "set-ups" for 200-acre cotton farms in the Corpus Christi area showed that the mechanical operations on the horse-operated farm would require 169.4 days of man labor and 647.8 days of horse work, as compared with 71.8 days of man labor and 66.2 days of tractor work on the tractor-operated farm. Using per hour rates of 18 cts. for horse work, 77 cts. for tractor work, and \$2 per day for man labor, the saving on the tractor farms would be \$851.50.

Data from 26 farms in the vicinity of Lubbock showed an average of 4.4 acres, yielding 1.8 bales of cotton, were picked per day by the mechanical method known as "sledding" at a cost of \$2.78 per bale, allowing \$3 per day for man labor and \$2 per day for 2-horse team.

Practices and costs of cotton-gin operation in north-central Texas, 1924-25. J. S. HATHCOCK (*U. S. Dept. Agr., Tech. Bul. 13 (1927). pp. 60, figs. 16*).—This bulletin gives the results of the analysis of cost and practice information obtained from 74 ginning businesses, mostly in Dallas and Ellis Counties, Tex. The investigation was made to ascertain the kind and quality of services rendered by gins, and to determine the factors influencing efficiency in gin operation. The businesses studied embraced 51 per cent of the native gins and 58 per cent of the bales ginned in the two counties during the year covered.

Ginning practices are discussed, including the location of gins, plant layout, ginning systems, labor requirements, management, charges, competitive practices, etc. The items of costs, income, and profits are analyzed on the basis of size of plants, volume of cotton ginned per plant, type of power used, and sources of income of the plants. Appendixes include miscellaneous tables on itemized costs of ginning and the articles of the Texas civil and penal codes affecting ginning operations, and discuss the methods used in the study in determining maintenance costs and capital investment.

Origin and distribution of the commercial potato crop. J. W. STROWBRIDGE (*U. S. Dept. Agr., Tech. Bul. 7 (1927), pp. 60, figs. 37*).—The potato statistical situation, as indicated by the Department's records for 1920 to 1925, inclusive, is presented. Graphical illustrations, together with statistical tables and comments, are included, showing the production areas, time of crop movement, the marketing season, carload distribution from 17 important areas, production and shipments by States, unloads at and supply of leading markets, and weekly summaries by States of the early crop and late crop carload shipments.

The potato situation in Idaho. C. F. WELLS and H. C. DALE (*Idaho Sta. Bul. 153 (1927), pp. VI+47, figs. 13*).—This is a statistical study of the acreage, production, and prices of potatoes in the United States; of the acreage, yield, prices, value per acre, expenses of production, markets for, marketing of, and the competitive factors in marketing early and late Idaho potatoes; and of the Idaho seed-potato situation. Although no definite forecast is made as to the future profitableness of growing potatoes in Idaho, the yields, prices, and costs per acre and per bushel apparently are tending to place the State in a better position to compete with Maine, Minnesota, Michigan, Wisconsin, and New York.

This bulletin is part 3 of the report noted on p. 81.

Survey of the wheat situation, April to July, 1927, M. K. BENNETT ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 10 pp. [1]+421-452, figs. 8*).—This continuation of studies previously noted (E. S. R., 57, p. 384) includes a study of the international trade, the new crop developments, price movements, visible supplies and outward carryovers, and the outlook for the 1927-28 crop year.

Reactions in exporting and importing countries to changes in wheat prices, A. E. TAYLOR (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 9, pp. [1]+413-420*).—The conditions giving rise to the differences in public attitude in the United States and Europe toward changes in wheat prices are discussed.

Larger markets for Montana wheat, E. J. BELL, JR. (*Montana Sta. Circ. 135 (1927), pp. 15*).—The possibilities and advantages of and the problems arising in connection with the direct shipment of wheat of high protein content from Montana to Pennsylvania mills are discussed.

The transportation of Canadian wheat to the sea, L. M. FAIR (*McGill Univ., Econ. Studies, No. 1 (1925), pp. 76*).—This monograph is the first of a series of the national problems of Canada to be published under the direction of the department of economics and political science of McGill University. Facts regarding the wheat production of Canada, the present methods of collecting, storing, and handling of the crop, and the present grain routes and rates are presented. The possibilities of the Montreal and Vancouver markets and of the proposed Georgian Bay Ship Canal, Hudson Bay, and St. Lawrence Deep Waterway routes are discussed.

The dairy situation in Idaho, F. W. ATKESON, D. L. FOURT, G. L. SULERUD, and B. H. CRITCHFIELD (*Idaho Sta. Bul. 152 (1927), pp. 83, figs. 37*).—This is part 2 of a tentative report of the agricultural situation in Idaho previously noted (E. S. R., 57, p. 683). Tables, graphs, and maps with interpretative text are included, covering the importance of dairying in Idaho, the national and regional expansion of the industry, the production trends in Idaho as a whole and in different districts of the State, and the factors bearing on the development of the dairy industry in Idaho. The outlook for dairying in the several districts of the State is discussed. Tables, graphs, and maps are also included presenting data regarding the marketing of milk and the manufacturing and marketing of dairy products in the United States and different districts of the United States and in Idaho.

Statistics of cattle, calves, beef, veal, hides, and skins (U. S. Dept. Agr., Statis. Bul. 20 (1927), pp. [2]+314).—Statistics are included on the number, losses, receipts at markets, shipments, slaughter, weights, exports, imports, prices, etc., of cattle and calves; on the production, consumption, receipts and supply at markets, exports, imports, cold storage holdings, prices, etc., of beef, veal, and beef products; and on stocks held, stocks disposed of, exports, imports, and prices of hides and skins. The data are for the year ended December 31, 1925, with comparable data for earlier years.

[Farming by cooperative societies], F. HAYWARD ET AL. (In *58. Annual Cooperative Congress, Belfast, 1926. Manchester: Co-operative Union Ltd., 1926, pp. 114-126*).—This is the report of the special committee on cooperative farming appointed by the United Board of the Cooperative Union, Limited. Tables are included showing the results of farming operations of retail and wholesale societies of consumers, 1915-1924. Thirteen reasons for the unsatisfactory results are enumerated and discussed briefly, and recommendations made.

Co-operative egg and poultry assembling units in Minnesota, H. B. PARCE and G. W. SPRAGUE (*Minnesota Sta. Bul.* 233 (1927), pp. 37, figs. 8).—The results are reported of a study based chiefly on data collected for the calendar year 1925 from cooperative egg and poultry assembling units in Minnesota. Tables are given and discussed comparing the items of the costs of plant operation, assembling, and general expense, and the total costs of ten of the cooperative assembling units, the percentages of the average cost per dozen eggs and pound of poultry being used instead of the actual costs as the basis of comparison. Accounting for cooperative egg and poultry associations, and the organization, operation, and other phases of the Lake Region Egg and Poultry Association, the overhead cooperative organization of the assembling units, are briefly discussed.

United churches, E. R. HOOKER (*New York: George H. Doran Co., 1926, pp. XIX+21-306, figs. 6*).—This volume is one of the series previously noted (*E. S. R.*, 57, p. 88) and is based upon material gathered from a study of American agricultural villages conducted by the Institute of Social and Religious Research between January, 1922, and December, 1925.

The material utilized includes field surveys of 83 united churches, 175 constitutions, 428 schedules of various kinds, and notes on interviews with denominational superintendents concerning more than 600 cases of church unions. The factors tending to undermine the barriers between rural churches of different denominations are discussed and a brief history given of the development of the different types of united churches. Comparisons are made of the four types of united churches and the average church and of the different types of united churches. The problems of united churches and how such churches have met them, and the endeavors of denominations and State interdenominational agencies to coordinate united churches and the existing religious order, are described.

The quantitative phases of human geography, E. HUNTINGTON (*Sci. Mo.*, 25 (1927), No. 4, pp. 289-305, figs. 7).—The use of quantitative methods of analysis, especially isopleth maps, in solving geographic problems is discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The organization and administration of a State program in agricultural education, E. W. GARRIS (*George Peabody Col. Teachers [Nashville], Contrib. Ed.* 35 (1926), pp. 85).—Analyses of the organization and the administration of State programs in agricultural education under the National Vocational Education Act and State plans for agricultural education are included. The data used were secured from 41 replies to a questionnaire sent to State supervisors in agricultural education, from 61 questionnaires filled in by white agricultural teachers in South Carolina attending the annual conference at Clemson College in June, 1925, from numerous personal letters, and from historical authorities. Results of the tabulations of the questionnaires on various phases of the organization and administration of State programs, State supervision, preparation of agricultural teachers, courses of study in vocational agriculture, and reimbursement of money for agricultural teaching are given.

Analysis of the operative jobs of a corn-growing enterprise, C. H. SCHOPMEYER and A. P. WILLIAMS (*Fed. Bd. Vocat. Ed. Bul.* 118 (1927), pp. V+13).—This is a type study of the operative training content for a corn-growing enterprise in Maryland. It illustrates the procedure in analyzing operative training content of farm jobs, and is a companion publication to Bulletin 101 (*E. S. R.*, 53, p. 495).

Cooperative extension work, 1925, C. B. SMITH ET AL. (*U. S. Dept. Agr., Coop. Ext. Work, 1925, pp. 120, figs. 31*).—This is the eleventh annual report on the cooperative extension work of this Department and the State agricultural colleges, and covers the year ended June 30, 1925, for funds expended, and the year ended December 31, 1925, for results of work. The funds and staff; the progress in program building and field studies of the influence of the work, of different methods and agencies employed, and of local leadership; the problems in determining and putting into operation the methods employed; the use of publications, visual presentation, and the radio; farmers' institutes; and conferences held are discussed. The economic results are reported and described under the headings of distribution of extension activities, demonstrations, practices adopted, the different field and horticultural crops, forestry, the different kinds of livestock, rural engineering, rodents and insects, agricultural economics, foods, nutrition, clothing, home management, home furnishing and beautification, and health and sanitation. The personnel, programs and plans of work, methods, conferences, project activities, and other phases of county agricultural agent work, home demonstration work, boys' and girls' 4-H club work, and negro extension work are described and discussed. Pages 80-119 are devoted to statistical tables.

FOODS—HUMAN NUTRITION

A comparative study of jellies and jams made with and without an extracted pectin, V. CARLSSON ([*Columbia Univ.*] *Teachers Col. Rec.*, 28 (1927), No. 8, pp. 784-794).—Fully ripe strawberries, raspberries, sour and sweet cherries, currants, blackberries, peaches, grapes, crab apples, and oranges were the fruits used in this comparative study of the quality of jams and jellies prepared by the usual household method without added pectin and by the procedure advocated by manufacturers with liquid extracted pectin. After standing 6 or 8 weeks, the products were scored by 10 judges for texture, flavor, appearance, and keeping qualities. The scores reported were the average of the average scores from 3 to 6 different trials.

In general the jellies made from fruits capable of jelling without additional pectin were of better color and more transparent when made with the extracted pectin than without, but did not retain their natural flavor as well, were of too firm a consistency, and tended to liquefy on standing. Satisfactory jellies were made from fruits which could not be used without added pectin. Similar results were obtained with the jams. The cost per glass of jellies made with extracted pectin was less than of those made without pectin, but the cost of the jams was higher with the pectin than without.

The chief advantages in the use of extracted pectin are considered to be a saving in time, the possibility of utilizing fruits such as strawberries and peaches incapable of jelling without pectin, and the disadvantages the tendency of the product to be too firm, to liquefy on the surface, and to lose some of its natural flavor. It is suggested that other studies should be made of the proportions of extracted pectin for various fruits, better methods of paraffining pectin jellies and jams, and the amount of corn sugar that may be used to substitute for cane or beet sugar in jellies and jams. A table is given of the definite yields in jellies and jams from a definite weight of fruit with and without added pectin.

Food values of poi, taro, and limu, C. D. MILLER (*Bernice P. Bishop Mus. Bul.* 37 (1927), pp. 25, fig. 1).—The food materials considered in this bulletin, which is the first of a series on the nutritive value of various Polynesian foods,

are steamed taro or dasheen; poi, prepared from steamed taro by 'pounding to a paste with a small amount of water and diluting to a consistency of about 20 per cent of solids; and limu, various species of fresh or salt water algae. The poi is usually allowed to ferment before being used.

A mixed sample of steamed taro, as used in the vitamin studies, was found to have the following composition: Water 64 per cent, protein ($N \times 6.25$) 1.18, fat (ether extract) 0.169, starch (acid hydrolysis) 20.31, starch (saliva hydrolysis) 24.56, sucrose 1.4, reducing sugars 0.391, ash 0.588, calcium 0.0263, and phosphorus 0.0612 per cent. The principal change taking place in the taro when made into poi and fermented was a decrease in the reducing sugars and sucrose. The H-ion concentration of fresh poi was pH 6 and that of completely fermented poi pH 2.75.

In the vitamin studies the Sherman technique was followed except that in the vitamin B work a gain of 25 gm. in 8 weeks was sought as in the A experiments, instead of maintenance as in the customary technique. The amount of steamed taro required daily as the sole source of vitamin A to bring about a gain of approximately 25 gm. in 8 weeks was 2 gm. for the irradiated rats. The gains in the nonirradiated rats were more irregular. No destruction of vitamin A was found to result in the manufacture of poi from taro. In the vitamin B studies the use of 2.5 gm. of taro resulted in a gain of about 25 gm. in 8 weeks and 3 gm. of poi in an average gain of 21 gm., thus indicating a slight loss in vitamin B. Both taro and poi were low in vitamin C, 10 gm. of taro prolonging the survival period to about 10 or 12 weeks, but not preventing death from scurvy. There seemed to be little destruction of C as the result of the fermentation process. From the values of calcium and phosphorus it is estimated that an amount of poi necessary to furnish 3,000 calories would supply sufficient calcium and phosphorus.

Two algae in common use by the Hawaiians, limu eleele and limu lipoa, had the following composition: Water 90.34 and 84.68, protein ($N \times 6.25$) 2.82 and 1.64 fat (ether extract) 0.0485 and 0.0287, ash 1.59 and 2.56, calcium 0.17 and 0.584, and phosphorus 0.0336 and 0.0156 per cent, respectively. The results in the vitamin studies were rather unsatisfactory on account of difficulties in securing sufficient consumption of the algae, but indicated a vitamin A value less than half that of taro, a vitamin B value of from one-fourth to one-sixth that of taro, and no antiscorbutic properties. Assuming availability of its mineral content, the limu as ordinarily eaten by the natives would supply about 0.05 gm. of calcium a day. Its value is thought to be in adding variety and palatability to a somewhat monotonous diet.

Basal metabolism as determined by the respiratory exchange, F. A. PICKWORTH (*Roy. Soc. [London], Proc., Ser. B, 101 (1927), No. B 708, pp. 163-185, figs. 6*).—To obtain more complete relaxation than is possible in basal metabolism determinations by the respiratory exchange as measured by the usual Douglas bag or spirometer method, an air-tight chamber has been constructed in which the subject lies or sits for a period of one or two hours and the change in composition of the atmosphere is measured by a modified Haldane air analysis apparatus. The apparatus and technique are described in full in part 1 of this paper, and in part 2 are reported data on its use in the study of various factors, such as relaxation of mind and body, sleep, fatigue, diet, irritation, hot bath, etc. Basal metabolism figures on normal subjects when fully accustomed to the apparatus are more than 20 per cent lower than those obtained by the bag method, and are thought to approach more nearly the true basal rate.

Dietary scales and standards for measuring a family's nutritive needs, E. HAWLEY (*U. S. Dept. Agr., Tech. Bul. 8 (1927), pp. 32, figs. 3*).—Five energy

scales and standards that have been proposed in the United States have been subjected to critical examination, and as a result a new scale for calculating the energy need of the family is proposed differing from the older standards primarily by increasing the energy allowance of girls. The dietary scales and standards examined were those of Atwater (E. S. R., 13, p. 974), the Bureau of Labor Statistics,¹ Sherman and Gillett (E. S. R., 37, p. 671; 38 p. 63), Lusk (E. S. R., 39, p. 568), and Holt (E. S. R., 47, p. 766).

The scale used by the Department of Labor was discarded as not being based on energy requirements. The chief differences in the other scales were in the allowances for boys and girls during growth. A comparison of the energy allowances with actual consumption figures obtained by Sherman and Hawley for children between 3 and 14 years of age (E. S. R., 48, p. 463) showed that the latter approximated the figures obtained by averaging the energy allowances recommended by Lusk and Holt. The author has, therefore, adopted for energy allowances the figures obtained by averaging those of Holt, reduced by 10 per cent (on account of a double allowance made by Holt for energy loss in the excreta), and those of Lusk. The values thus obtained follow the same general trend as those of Atwater and of Sherman and Gillett for boys, but are considerably higher for girls under 15 years, particularly from 11 to 15. In the use of these figures for a dietary scale, allowance is made for varying activity at all ages as shown in the accompanying table, which also gives a scale for protein and minerals (phosphorus, calcium, and iron). This is based upon consumption figures reported by Holt for protein and Sherman and Hawley for calcium and phosphorus. The method of using the double scale in calculating a family's nutritive needs is illustrated.

Double scale for calculating the energy and the protein and mineral needs of a family

Age of individual (years)	Degree of activity	Energy scale ¹		Protein and mineral scale ²	
		Male	Female	Male	Female
Over 60.....	Moderately active.....	0.9	0.7	0.9	0.7
Do.....	Sedentary.....	.8	.6	.8	.6
18 to 60.....	Active.....	1.2	.9	1.1	.9
Do.....	Moderately active.....	1.0	.8	1.0	.8
Do.....	Sedentary.....	.8	.7	1.0	.8
15 to 17.....	Moderately active.....	1.1	.9	1.5	1.0
10 to 14.....	do.....	.8	---	1.3	---
13 to 14.....	do.....	---	.9	---	1.3
10 to 12.....	do.....	---	.8	---	1.2
6 to 9.....	do.....	.6	.6	1.0	1.0
Under 6.....	do.....	.4	.4	.8	.8

¹ 1.0=3,000 calories.

² 1.0=67 gm. of protein, 1.3 gm. of phosphorus, 0.68 gm. of calcium, and 0.015 gm. of iron.

Nearly half of the bulletin is devoted to a critical study of the use to which dietary scales and standards have been put in the United States. The chief points brought out by this study are as follows: "(1) In the majority of dietary studies the investigators have failed to recognize the relationship that exists between energy scales and standards and have accepted results which may be as much as 20 per cent from the true figure. (2) In order to compare results obtained by the use of different energy scales, corrective factors may be neces-

¹ Tentative quantity and cost budget necessary to maintain a family of five in Washington, D. C., at a level of health and decency. U. S. Dept. Labor, Bur. Labor Statist., 1919, pp. 75.

sary. It is possible to derive such a factor for each scale if average families selected from a large number of samples are used in determining these factors. Corrective factors based on the arithmetic means of 23 studies are given."

A list of 39 references to the literature is appended.

Standards of living among intermediate income groups in China, A. B. MILAM (*Jour. Home Econ.*, 19 (1927), No. 8, pp. 427-435).—Included in this report of a study of Chinese home life in north central and south China during 1922-1924 are data on food expenditure and selection of 16 families belonging to the upper and middle class sections of Chinese society. The average distribution by weight of the foods among the various groups was cereals 40.9, vegetables including bean curd 10.8, oils and other fats 6.3, meats, fish, and game 12.3, sweets and accessory foods 12.3, fruits 9.3, and milk 4.9 per cent. Arranged in five groups according to income, the percentages of cereals decreased and of vegetables and nuts increased with increasing income. No sweets, fruit, or milk were used by the group of lowest income, and the amounts of meats, fish, and game were also negligible. The average expenditure of food by the 16 families was only 28 per cent of the entire income.

Nutrition work with children, L. J. ROBERTS (*Chicago: Univ. Chicago Press*, 1927, pp. XIV+394, pls. 10, figs. 15).—This volume, although designed primarily as a text for college or university classes in nutrition, is a useful reference book for any one interested in the subject of malnutrition in children and its prevention and control. The first half of the volume deals chiefly with the nature, causes, and effects of malnutrition and with standards of normal nutrition, and the second half with nutrition work in schools and with pre-school children, the part taken by national agencies in the nutrition movement, and parental and preparental education. Abundant references to the literature are given at the end of each chapter and numerous photographs and other illustrative material throughout the volume.

Reports of the Committee for the Investigation of Dental Disease.—II, The incidence of dental disease in children, N. G. BENNETT ET AL. (*[Gt. Brit.] Med. Research Council, Spec. Rpt. Ser., No. 97 (1925), pp. 48, pl. 1, figs. 4*).—This report on the dental inspection of 4,000 children in public elementary schools of England should be of value to nutrition workers concerned with the examination of the teeth as an index of faulty nutrition in children. The main points considered were eruption of permanent teeth, incidence of caries in permanent teeth, surface distribution of caries, arrested caries, hypoplasia, gingivitis, and malocclusion. Statistical tables prepared from the data obtained are assembled in an appendix.

Studies on vitamin deficiency diseases, T. MASAKI (*Jour. Amer. Dental Assoc.*, 14 (1927), No. 9, pp. 1654-1656).—This is a brief report of the results obtained in an investigation of the changes in teeth and their surrounding tissues of guinea pigs as a result of vitamin C deficiency and of rats as a result of vitamin A deficiency, together with changes in the oral and lingual mucous membranes of rats resulting from vitamin A deficiency.

The chief conclusions drawn from the vitamin C studies are as follows: The changes in the teeth consisted of imperfect development of enamel, dentine, and cement, the changes in the enamel being evident microscopically in about a week; changes in the softer dental tissues, especially the pulp, characterized chiefly by hemorrhagic inflammation; and the appearance of calcified striations in the dentine varying with the degree of scurvy.

As no attempt was made to provide vitamin D in the vitamin A studies, some of the results obtained were probably due to a deficiency of D rather than of A. Histological changes in the hard dental tissue are described as no structural

defect on the enamel, but morphological changes consisting of localized spots or markings, proper formation of the matrix of the dentine, but imperfect calcification and absorption of cement. The changes in the soft dental tissues were mainly circulatory disturbances, including a marked enlargement of the vessels and the vacuole formation between the odontoblasts and pulp cells in the pulp. Changes in the maxillary bones are also noted. The changes in the teeth and bones are considered to be due to disturbances in calcium metabolism. The changes noted in the oral and lingual mucous membranes were hyperkeratosis and atypical proliferation of the epithelium covering the mouth cavity, gums, and tongue, suppurative inflammation of the tongue, and atrophy and necrosis of the glandular cells of the salivary gland.

The sensitivity of vitamin-deficient animals toward arsenic compounds [trans. title], A. GROS (*Biochem. Ztschr.*, 184 (1927), No. 4-6, pp. 360-369).—Rats which had developed symptoms of xerophthalmia and rickets on the rachitic diet of McCollum, Simmonds, Shipley, and Park were found to be sensitive to much smaller doses of various arsenic compounds injected subcutaneously than control animals on a complete diet. The lethal dose of arsenic acid for the vitamin-deficient animals was 8 mg. and for normal controls 15 mg. daily, and that of Arsacetin 200 and 550 mg., respectively. These experiments are considered to demonstrate a lowered resistance of the organism resulting from vitamin deficiency.

The vitamin content of wheat and rye germs [trans. title], A. SCHFUNKERT (*Biochem. Ztschr.*, 183 (1927), No. 1-3, pp. 113-121, figs. 4).—According to the limited amount of data presented, wheat germs and rye germs contain significant amounts of vitamin A, considerable vitamin B, and no vitamin C. Rye germs and a commercial product "Materna" prepared from them were thought to have a slightly higher content of both A and B than wheat germs. As a source of A for rats the materials were fed in 1- and 2-gm. daily amounts and of B in 0.5- and 1-gm. amounts.

Vitamin A formation in the etiolated wheat shoot, T. MOORE (*Biochem. Jour.*, 21 (1927), No. 4, pp. 870-874, fig. 1).—The conflicting literature on the synthesis of vitamin A in etiolated wheat shoots is reviewed, and further experimental work is reported from which the conclusion is drawn that vitamin A may be formed in etiolated tissues.

Four rats on a basal diet deficient only in vitamin A, vitamin D being furnished by 5-mg. daily doses of irradiated cholesterol supplemented first by 10, then 20, and finally 30 wheat seeds daily, showed unmistakable signs of a deficiency of vitamin A and died or were killed in a moribund condition, while four others receiving shoots from the same number of seeds grown in the dark for 10 days grew at approximately normal rate for several weeks after the number of shoots had been raised to 30 daily. The feeding of the shoots was continued for some months after the death of the control animals. Although the rats were not in as good condition as those receiving a liberal diet, the final condition was fair.

Vitamins A and D of spinach, S. G. WILLIMOTT and F. WOKES (*Biochem. Jour.*, 21 (1927), No. 4, pp. 887-894, fig. 1).—Attention is called to various attempts to determine whether spinach contains any vitamin D, particularly to the recent work of Roscoe (*E. S. R.*, 57, p. 302), in which rabbits were used as experimental animals in order to secure larger consumption of the spinach. The substitution of the rabbit for the rat is criticized on account of differences in their digestive and assimilative processes and the alterations in calcium-phosphorus ratio resulting from large doses of the spinach. In the present study an acetone-ether extract of dried spinach practically free from minerals was used as the sole source of vitamin D for rats on both high fat and low fat

rachitic diets. The extract was prepared by drying fresh spinach in thin layers in the air at 18° C. for 2 days, breaking up and grinding the residue in a mortar until it passed a No. 10 sieve, extracting the powder at room temperature successively with dry ether 3 times and dry acetone twice, and evaporating the solvent rapidly in vacuo. The pasty mass thus obtained represented 0.45 per cent of the fresh leaves. Growth, presence or absence of xerophthalmia (indication of vitamin A), the fecal reaction at daily intervals by the method of Redman, Willimott, and Wokes (*E. S. R.*, 57, p. 789), and microscopic examination of the bones at the end of the 10-week experimental period were recorded.

On the high fat diet 25 mg. of the spinach extract, equivalent to about 6 gm. of fresh leaves, was sufficient to prevent xerophthalmia and bring about steady but subnormal growth and a change in the fecal pH from acid to alkaline. Microscopic examination of the bones revealed very slight rickets in several, but not in all, cases. On the low fat diet 100 mg. of the extract was first administered, but even on this amount the fecal reaction remained alkaline and there were signs of rickets.

It is concluded that the extract is a convenient and reliable source of vitamin A, practically free from vitamin D.

Vitamin studies.—XV, Assimilation of vitamins A and D in presence of mineral oil, R. A. DUTCHER, J. O. ELY, and H. E. HONEYWELL (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 953-955, fig. 1).—In this preliminary report, continuing the series previously noted (*E. S. R.*, 56, p. 190), representative growth curves are given, showing that butterfat as a source of vitamin A is rendered ineffective when given dissolved in mineral oil. It is thought that the mineral oil has greater solvent power for vitamin A than the butter and is thus capable of removing it from the body.

No evidence has been obtained as yet that the calcifying potency of the oil is appreciably affected by the presence of mineral oil, although it is thought possible that increased amounts of the oil might have a solvent effect on the antirachitic factor.

Experiments on nutrition.—VI, Balance of food by vitamin B, R. H. A. PLIMMER, J. L. ROSEDALE, and W. H. RAYMOND (*Biochem. Jour.*, 21 (1927), No. 4, pp. 913-939, pl. 1).—Miscellaneous feeding experiments on chickens, ducks, pigeons, and rats with various alterations in the diet to determine the relation of vitamin B to protein, fat, and carbohydrate are reported in continuation of earlier work (*E. S. R.*, 51, p. 376), with the conclusion that all of these constituents require balancing by vitamin B. Based upon the numerous observations reported, the authors conclude that "vitamin B appears to be of fundamental importance in life, having a rôle not only in general metabolism, but also a special rôle in relation to the endocrine organs. We believe that vitamin B is a definite and important chemical constituent of every cell, in fact a constituent of the nucleus. Without vitamin B the nucleus can not exist. The greater abundance of vitamin B in nuclear tissues supports such a proposition, and, if Funk's original 'vitamine' and other substances which have been isolated be accepted, the nuclear connection is emphasized by the fact that these substances belong to the pyrimidine or purine groups."

The effect of the administration of glycine to pigeons on a diet deficient in vitamin B, S. K. KON (*Biochem. Jour.*, 21 (1927), No. 4, pp. 837-839).—Administration of glycine in amounts sufficient to raise the metabolism markedly had no beneficial effects on pigeons which had lost appetite on polished rice, but on the contrary appeared to hasten their decline. The harmful effects are attributed to the high osmotic pressure of the solution administered and the inability of the birds to empty their crops normally rather than to toxic action

of the glycine itself. A similar explanation is advanced for the harmful effects of carbohydrates administered to vitamin B-deficient pigeons as reported by Collazo (E. S. R., 50, p. 163).

The effect of turnip on avian polyneuritis, A. A. HORVATH (*Japan Med. World*, 7 (1927), No. 3, pp. 71-75).—Raw turnip juice is reported to be of some benefit in light cases of polyneuritis in pigeons, but to have little or no effect in severe polyneuritis. A diet of polished rice and diluted raw turnip juice, 1:1, lowered the occurrence of polyneuritis by 50 per cent.

Blood sugar changes in avian polyneuritis, H. E. REDENBAUGH (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 842, 843).—Data are given on the content of blood sugar, as determined by the Folin-Wu method, in 7 normal pigeons and 11 pigeons in the convulsive stage of polyneuritis. The blood samples were drawn from the heart by means of needle and syringe without anesthesia.

The minimum, maximum, and average values obtained for the normal pigeons were 176.2, 215, and 193.7 mg. and for the polyneuritic pigeons 241, 555, and 368.7 mg. per 100 cc., thus indicating a marked hyperglycemia at the active stage of polyneuritis.

Antineuritic yeast concentrates.—II, The use of Norite charcoal in the concentration of torulin, H. W. KINNERSLEY and R. A. PETERS (*Biochem. Jour.*, 21 (1927), No. 4, pp. 777-790).—Improvements in the method of preparing the antineuritic concentrate torulin (E. S. R., 55, p. 409) are described, and the question of its identity with the factor essential for the prevention of human beriberi is discussed.

The principal change from the original technique consists in treating the filtrate from the neutral lead acetate precipitate with cold saturated baryta before adding mercuric sulfate. This serves to flocculate the gums present and thus facilitate subsequent filtrations. The optimum H-ion concentration for adsorption of the active material by Norite has been established at pH 7 if mercuric sulfate has been used in the purification. It has been found possible to substitute Norite for the mercuric sulfate, but the resulting yield of active material is smaller. At pH 2.5 Norite adsorbs the greater part of the material precipitable by mercuric sulfate, after which, by adjusting the reaction to pH 7 and adding fresh Norite the active material is adsorbed as in the usual method. The use of Norite in place of mercuric sulfate is recommended when the material is to be used for long-continued feeding tests.

For the material obtained from 14 lbs. of bakers' yeast, adsorption by Norite was most complete in two stages, using 60 gm. of Norite in the first and 20 in the second. The active material is set free from each charcoal fraction by two successive treatments on the hot water bath for an hour with about 200 cc. of $N/10$ HCl, followed, if maximum yield is desired, by two extractions with about 150 cc. of 50 per cent acid alcohol. The combined extracts, freed from the last traces of sulfuric acid by dilute barium chloride, are concentrated in vacuo at a temperature not exceeding 60° C. to a volume of 50 cc. and contain at this point between 1,200 and 2,000 doses of activity from 0.4 to 1 mg. daily. By fractionating with alcohol, as previously described, the material can be concentrated still further to an activity of from 0.15 to 0.3 mg. daily.

Unsuccessful attempts were made to concentrate the extract previous to fractionation with alcohol by the method described by Jansen and Donath (E. S. R., 57, p. 489). In commenting upon this the authors state that "we lay no stress upon our failure to concentrate torulin in our fractions by a method applicable to the protective (? antiberiberi factor) in rice polishings. Doubtless it lies in some peculiarity of the yeast extracts. It is, however,

possible that the antiberiberi factor is distinct from torulin. The question at issue seems to be whether torulin is distinct from the antiberiberi factor, and what relation these properties of extracts bear to the protective factor in the sense of Jansen and Donath. It is indeed possible that the train of symptoms cured by torulin can only arise when absence of some other factor has accentuated a special phase of metabolism. This would explain certain abnormal responses to test doses, and would also justify the feeling that curative tests upon pigeons are not a reliable guide where human beriberi is concerned."

Vitamin C in fresh grass (*Lolium perenne*; English rye) and the weight of various organs in scurvy [trans. title], E. BROUWER (*Biochem. Ztschr.*, 187 (1927), No. 1-3, pp. 183-193, figs. 3).—Green rye is shown to be rich in vitamin C, 1 gm. daily sufficing for complete protection to guinea pigs on a basal diet of oats and autoclaved milk. Smaller amounts were not tested. No difference was noted in the potency of grass cut in the spring, summer, or fall. For the purpose of comparing the weight of the organs of scorbutic and healthy guinea pigs, some of those receiving the rye as a source of vitamin C were given the same amount of the basal ration as that voluntarily eaten by the control scorbutic animals and were killed when the controls died of scurvy. As shown by the weights of the various organs of the healthy and scorbutic guinea pigs, the most marked changes in the scorbutic animals were an increase in the weight of the adrenals and a decrease in that of the thymus.

Growth-promoting value of cod liver oil irradiated by sunlight and the mercury vapor lamp, A. L. DANIELS and L. M. BROOKS (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 971, 972).—In order to obtain further evidence as to the possibility of increasing the antirachitic potency of cod-liver oil, three groups of six young rats each were fed a basal rachitic ration supplemented by 1 per cent of Norwegian cod-liver oil dissolved in 2 per cent of corn oil. The cod-liver oil for one group had received no treatment, for another had been exposed to direct solar rays, and for a third had been irradiated with a mercury vapor lamp at a distance of 2 ft. for 20 minutes. Two other groups serving as controls received the basal ration alone, in one case untreated and in the other irradiated with a mercury vapor lamp in the same manner as the cod-liver oil.

As judged by the growth of the different groups through the experimental period of 8 weeks, the irradiated cod-liver oil was no more effective than the untreated oil. That growth was a measure of antirachitic vitamin rather than vitamin A was thought to be demonstrated by the fact that the group receiving the irradiated basal ration made the greatest gains in growth.

Is the antirachitic vitamin of cod-liver oil an irradiated ergosterol? A. ADAM (*Klin. Wchnschr.*, 6 (1927), No. 27, p. 1289).—In a brief note the author reports that fractional extraction of the unsaponifiable matter of cod-liver oil with alcohol at varying H-ion concentrations yields products of different properties. The extracts at from pH 3 to 5 are pale yellow in color, while with increasing pH the color darkens. The acid extracts give a spectrum identical with that of irradiated ergosterol and are more strongly antirachitic than the alkaline extracts. Other similar properties are noted from which it is inferred that the vitamin is contained in the acid fraction of the unsaponifiable matter.

The influence of the administration of cod-liver oil to the mother on the development of rickets in the infant, A. A. WEECH (*Bul. Johns Hopkins Hosp.*, 40 (1927), No. 4, pp. 244-258, figs. 2).—The subjects of this study were

colored babies from Johns Hopkins Hospital. The mothers of 3 out of every 4 were given 1 teaspoonful of cod-liver oil three times a day from the birth of the babies and were instructed to continue taking the oil until the babies were weaned. No oil was given any of the babies. At the end of 6 months Röntgenograms and blood analyses were obtained from all of the babies whose mothers had continued the treatment. Of 260 patients originally enrolled, only 47 were available at the end of the time, the mothers of 9 of whom had had no cod-liver oil.

Although there were individual cases showing wide variation in the extent of rickets regardless of the cod-liver oil, the average extent of rickets as judged both by X-ray and the calcium-phosphorus product varied inversely with the amount of cod-liver oil taken by the mothers. Of the entire number of cases, only 6 were examined in May, when a seasonal reduction in rickets might have taken place.

The author concludes that "when cod-liver oil is given to a mother a certain amount of the antirachitic vitamin does pass into her milk, and that even though in individual cases the amount so transmitted to the infant may be insufficient to prevent manifestations of the disease, nevertheless when the average degree of rickets existing in a group of such infants is considered, the transfer has been sufficient to raise considerably the calcium-inorganic phosphorus product of the blood serum and to lessen the Röntgenographic evidences of disease."

Effect of antirachitic vitamin on the phosphorus, calcium, and pH in the intestinal tract. L. YODER (*Jour. Biol. Chem.*, 74 (1927), No. 2, pp. 321-329, figs. 2).—In this investigation of the relation of the antirachitic vitamin to the H-ion concentration of the intestinal contents and to the absorption and excretion of calcium and phosphorus, 7 albino rats weighing 150 gm. each were fed a rachitic ration for 21 days, after which 3 were continued on the ration alone, 2 received in addition 4 per cent of cod-liver oil, and 2 were irradiated for 10 minutes daily. Calcium and phosphorus utilization was determined at frequent intervals by the method described by Bergeim (*E. S. R.*, 56, p. 192) until the thirtieth day of the experiment, when one animal from each group was chloroformed and the H-ion concentration of sections of the intestinal tract determined with the quinhydrone electrode. At the same time H-ion concentration determinations were made of the feces of the corresponding living rats.

The figures for calcium and phosphorus utilization showed a steady decrease in the utilization of phosphorus and an irregular decrease in that of calcium for the rats on the rachitic diet. The addition of cod-liver oil and irradiation of the animals caused at first a decrease in phosphorus utilization, followed by marked increases in the utilization of both calcium and phosphorus. The preliminary decrease in phosphorus utilization is thought to indicate excretion of the phosphorus into the intestine.

The pH results were in agreement with those reported by Zucker and Matzner (*E. S. R.*, 51, p. 464) and Abrahamson and Miller (*E. S. R.*, 54, p. 391) in showing increased acidity of the feces and intestinal tract following irradiation or cod-liver oil treatment. In the present study a difference between cod-liver oil and irradiation was shown in that cod-liver oil lowered the pH values throughout the entire intestinal tract of rats on a rachitic ration, while irradiation lowered the values only beyond the duodenum.

The author is of the opinion that the pH test proposed by Zucker for the antirachitic vitamin is reliable.

Rickets in rats.—III, Metabolism of calcium and phosphorus of rats on restricted food intakes. A. T. SHOHL and H. B. BENNETT (*Jour. Biol. Chem.*,

74 (1927), No. 2, pp. 247-256, figs. 2).—This study was undertaken chiefly on account of the fact that in the previous study of the effect of phosphate added to the diet of rachitic rats (E. S. R., 57, p. 490) the food intake was low during the first week of the experimental period and the healing effect might thus be ascribed to the restricted diet. It was found, however, that reduction of the rachitic diet for six days to one-third the amount normally consumed brought about only slight changes. "The blood serum changes are toward normal. The bone histology is that of rickets without healing. The bones show loss of calcium. The positive balances of calcium and phosphorus are reduced to a minimum." It is concluded that the changes reported in the previous paper are due not to fasting but to the addition of phosphate to the diet.

The antirachitic activity of monochromatic and regional ultra-violet radiations, A. F. HESS and W. T. ANDERSON, JR. (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 15, pp. 1222-1225, figs. 3).—Essentially noted from a preliminary report by Hess and Weinstock (E. S. R., 57, p. 792).

Evidence of rickets prior to 1650, J. A. FOOTE (*Amer. Jour. Diseases Children*, 34 (1927), No. 3, pp. 443-452, figs. 7).—As indication of the prevalence of rickets in the fifteenth century, the author lists various religious paintings of the period in the Netherlands and Germany in which the children showed clinical signs of rickets. Several well-known masterpieces of the period are reproduced, with descriptions of the clinical evidence of rickets.

Pellagra: Its nature and prevention, J. GOLDBERGER (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 35, pp. 2193-2200).—This general discussion of pellagra is essentially a revision of an earlier paper (E. S. R., 39, p. 70) to include the author's present conception of the disease as being due to lack of a specific pellagra-preventive vitamin present most abundantly in yeast and fresh meat (E. S. R., 55, p. 890).

The nature of the material in liver effective in pernicious anemia, I. E. J. COHN, G. R. MINOT, J. F. FULTON, H. F. ULBICHS, F. C. SARGENT, J. H. WEARE, and W. P. MURPHY (*Jour. Biol. Chem.*, 74 (1927), No. 1, pp. LXXIX-LXXXII).—In an effort to determine the chemical nature of the constituent of liver responsible for its favorable action in pernicious anemia and if possible to isolate the active fraction for use in place of liver, the authors have fractionated raw liver essentially as follows:

Raw minced liver is first brought to pH 9, and the extractives soluble at this alkalinity are filtered from the insoluble residue (A). The soluble extractives are brought to pH 5, the isoelectric point of the chief protein of the liver, and the protein precipitate (B) is filtered off. The filtrate is heated to 70° C. and the heat-coagulable proteins (C) are filtered off. The nonprotein extractives (D) are then extracted with ether, and the ether-insoluble nonprotein fraction (E) is filtered from the ether-soluble extractive (EE) and extracted with alcohol. The alcohol-soluble extractives (F) are finally separated from the alcohol-precipitable extractives (G).

Of the various fractions, (A) and (B) have been shown to be quite inactive in the treatment of pernicious anemia, (C) has not yet been tested, (D), (E), and (G) are effective, and (F) appears to contain substances capable of reducing blood pressure. Fraction (D), which apparently contains all of the active material, is being subjected to further study. Analyses of several (D) and (G) fractions are reported.

A diet rich in liver in the treatment of pernicious anemia, G. R. MINOT and W. P. MURPHY (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 10, pp. 759-766, figs. 2).—Additional and even more convincing proof of the value of liver in the

treatment of pernicious anemia is given in this report of a continuation of the treatment with the 45 patients reported on a year ago (E. S. R., 56, p. 294) and 60 others, making a total of 105 cases which have been treated from 3 months to 3 years with a diet furnishing about 200 gm. of liver daily. In all but 6 of the patients the red blood cells have reached 4,000,000 or more per cubic millimeter and have remained at or above this level except for temporary drops generally associated with partial or complete omission of the prescribed amount of liver. In the entire group there have been only 3 deaths, 1 accidental and the other 2 of causes other than the anemia. Brief mention is made of the efficacy of the nonprotein fraction of liver, the preparation of which is noted above.

"Our observations show that a few grams of the purest fraction or 15 gm. of a less pure fraction of liver taken daily by mouth as a powder or in aqueous solution have yielded results comparable to those obtained when 200 or more gm. of whole liver have been eaten. Thus, in the future one may be able to prescribe a small amount of a powder rather than a large amount of liver. Even so, the patient must take a well balanced, adequate diet, preferably similar to that our patients have had except for the amount of liver."

Treatment of pernicious anemia with a high caloric diet, rich in vitamins. K. K. KOESSLER and S. MAURER (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 10, pp. 768-774).—The authors have continued with marked success their treatment of pernicious anemia by a "high vitamin, high caloric diet, furnishing the meats chiefly in the form of liver, kidney, and other edible viscera" as previously described (E. S. R., 56, p. 293). They are still of the opinion that although the value of the nonprotein extract of liver prepared by Cohn et al. noted above has been demonstrated, the fat-soluble vitamins are a factor of primary importance in blood regeneration. The recommendation by Minot and Murphy of a diet low in fat is thought to be unjustified by experimental and clinical evidence and on the ground that butter, cream, milk, and cod-liver oil are important sources of fat-soluble vitamins. A sample 24-hour menu as used in their treatment is included.

Recent advances in pernicious anemia (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 10, pp. 793, 794).—An editorial discussion dealing chiefly with the above-noted papers of Minot and Murphy and of Koessler and Maurer.

Simple experimental anemia and liver extracts. G. H. WHIPPLE and F. S. ROBSCHT-ROBBINS (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 860-864).—On account of the interest in the preparation and use of liver extract in pernicious anemia, the authors have reported briefly some of their work on liver extracts in the treatment of simple secondary anemia in dogs. The materials tested included (1) an aqueous extract prepared by boiling the ground liver with about three times its volume of water containing 0.1 per cent hydrochloric acid for 2 minutes, filtering, and concentrating the filtrate to about one-fourth the original volume; (2) an alcoholic extract prepared by extracting the residue from the water extraction with 95 per cent alcohol at 38° C. for 24 hours, repeating the process, and concentrating the combined extracts to a thick paste on the steam bath; and (3) the residue after the water and alcohol extraction was freed from alcohol by boiling with water.

When tested by the methods followed in work previously reported (E. S. R., 56, p. 494), all three of the materials proved effective in hemoglobin and red cell formation, but the sum of the effects of the three extracts did not equal the effect of whole liver feeding.

The specificity of the Minot-Murphy diet in pernicious anemia. I. C. BRILL (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 15, p. 1215, fig. 1).—This is a

brief report of the treatment by the Minot-Murphy dietary method of 10 cases of pernicious and 4 of severe secondary anemia. The tabulated results of changes in hemoglobin percentage and red cell counts show consistently a marked improvement in the pernicious anemia group and no significant changes in the secondary anemia group. These results are thought to support the theory that the Minot-Murphy diet furnishes a necessary metabolic substance bearing a specific relation to pernicious anemia not unlike the relation which insulin bears to diabetes.

TEXTILES AND CLOTHING

Selected list of Government publications on textiles and clothing, compiled by R. VAN DEMAN (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 3* (1927), pp. 15).—An annotated list in mimeographed form of about 60 Government publications on textiles and clothing selected as being of value to home economics workers. "Though many of these bulletins deal with production rather than consumption, the results can often be so interpreted as to be applicable to home economics questions and may suggest problems for research directly from the consumer's standpoint."

[Textile research] (*Textile Recorder*, 45 (1927), No. 534, pp. 44, 45, 65, fig. 1).—Papers presented at the textile section of the British Association for the Advancement of Science meeting at Leeds University September 1, 1927, and summarized in these pages included The Standardisation of the Fastness of Dyestuffs, by S. G. Barker (p. 44); Worsted Spinning Research, by H. Priestman and A. W. Stevenson (pp. 44, 45); The Inheritance of Some Colours and Patterns in Sheep, by J. A. F. Roberts (p. 45); The Intracellular Structure of the Wool Fibre, by J. B. Speakman (p. 45); Cotton-Growing Policy: The Influence of Climate on Staple Quality, by E. E. Canney (p. 45); The Action of Sunlight on Cotton, by G. Barr and I. H. Hadfield (pp. 45, 65); Predetermination of Wool Cloth Prices, by T. Oliver (p. 65); and The Extensibility of Flax Yarns, by J. A. Matthew (p. 65).

Ultra-violet transmission of fabrics (*U. S. Dept. Com., Bur. Standards Tech. News Bul. 126* (1927), pp. 4, 5).—Further measurements (E. S. R., 57, p. 693) were made on close-weave and open-weave fabrics submitted as approximately pure cellulose (viscose) and cellulose acetate rayons.

After eliminating the light transmitted through the openings between the threads the following ultra-violet transmission coefficients have been deduced for the white, bleached, uncolored threads: Viscose from 16 to 27 per cent, cotton 17 to 20, cellulose acetate 11 to 20, silk 14 to 18, and wool from 5 to 15 per cent. A slight coloring of the fabric by dyes or yellowing with age greatly decreases the transmission of the ultra-violet rays. Tests on thin homogeneous colorless films of viscose rayon and on cellulose acetate rayon showed that the latter is more opaque to the short wave length ultra-violet rays, agreeing with tests indicating that the average viscose thread is more transparent than the average thread made from cellulose acetate.

After deducting for the openings between the threads, the transmission through the thread, especially when dyed, is only of the order of about 5 to 10 per cent. Considering that the thread occupies from 95 to 99 per cent of the total space, transmission of only 10 per cent of the total incident light appears insignificant. In order to obtain beneficial therapeutic results it appears that an open-weave fabric should be worn. Consequently it seems of but little difference whether the thread is of cellulose acetate, cotton, wool, or silk.

The effect of temperature and humidity on cotton spinning, with particular reference to conditions in Bombay. A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul.* 9 (1927), pp. [3]+46).—Spinning tests were made on six standard Indian cottons and one American cotton, the textile characteristics of which have been described earlier (E. S. R., 57, p. 694). Each of these was spun in duplicate into three counts of yarn under the following conditions: (1) Medium dry, i. e., when the outside relative humidity is at its lowest; (2) normal, i. e., temperature about 80° F. and relative humidity about 65 per cent; and (3) monsoon, i. e., temperature 90° and relative humidity about 70 per cent.

Yarn tests and observations showed that for comfort the normal conditions seemed more satisfactory than either of the extremes. For workability of the material the medium dry conditions did not quite suffice in the card room, whereas the normal and monsoon conditions were satisfactory throughout. Yarn spun under medium dry conditions was the least satisfactory in appearance, and that spun under monsoon conditions was the best, although such differences practically disappeared when the yarn was conditioned. Conditions giving rise to the strongest yarns could not be determined from the test results. In general, the processing of the material in cotton spinning and the quality of the spun yarn were not seriously affected by the spinning process at relative humidities as low as 40 per cent, although the normal conditions seemed best for carrying out cotton-spinning tests. Bombay conditions are deemed practically ideal for the processing of material in cotton spinning.

The distinctions between flax and hemp fibers. A. HERZOG (*Die Unterscheidung der Flachs- und Hanffaser. Berlin: Julius Springer, 1926, pp. VII+109, pl. 1, figs. 105*).—The physical and chemical characteristics of the bast cells of flax and hemp and the general characters of the technical fibers of these plants are described, and methods are outlined, with determinative tables and lists of reagents necessary for the determination of these fibers. A list of 108 references is included.

The intracellular structure of wool fibres. J. B. SPEAKMAN (*Jour. Textile Sci.*, 2 (1927), No. 1, pp. 12-14).—A study at Leeds University of the nature of the cell contents of different wools gave indications that differences between wools are due in part to changes in the constitution of the component cells which find quantitative expression in terms of variations in the nature of the viscous medium and the variable frequency distribution of fibrillae of differing elasticity.

The comparative manufacturing values of Peruvian and "Improved Peruvian" wools. [A. F.] BARKER (*Jour. Textile Sci.*, 2 (1927), No. 2, pp. 55-57, figs. 4).—Spinning tests showed that the Improved Peruvian wool is a wool which in general possesses the good qualities of the native Peruvian wool, but may be spun much finer and will yield that cleanness combined with softness much sought for by spinners of yarns for both hosiery and woven fabrics.

Paint in wool and its removal. C. E. MULLIN (*Textile Recorder*, 45 (1927), No. 534, pp. 55, 57, 59).—The contamination of wool by paint and tar during the branding of sheep is discussed, with methods for its removal from fleeces and textiles and comments on the uses of depainted wool.

Physical data on different rayon products [trans. title], REINECKE (*Melliand Textilber.*, 7 (1926), No. 6, pp. 542, 543).—A table shows the comparative regularity, strength, elasticity, and other data for 32 brands of rayon.

Rayon issue (*Textile World*, 72 (1927), No. 13, pp. 59-102, figs. 48).—Similar in scope to a group noted earlier (E. S. R., 55, p. 896), the articles included

in these pages are concerned with the status of and outstanding developments in the rayon industry, new uses and methods for rayon, and textile research involving rayon.

Dyeing of hosiery containing mixed fibres, W. A. EDWARDS and G. F. HARDCASTLE (*Jour. Soc. Dyers and Colourists*, 43 (1927), No. 8, pp. 249-251).—Methods are outlined for dyeing hosiery of wool-cotton, wool-rayon, wool-silk, cotton-rayon, and cotton-silk mixtures.

Note on a Chinese vegetable dye, F. A. MCCLURE (*Lingnaam Agr. Rev.*, 4 (1927), No. 1, pp. 31-37, pl. 1).—A brown dye (shue leung) derived from the tubers of *Dioscorea rhipogonoides* is used to dye fish nets, plain cotton cloth, and a silk termed "coolie cloth." The preparation of the dye and the dyeing of the silk are described briefly.

Spots on rugs and how to remove them, G. McHUGH (*Natl. Cleaner and Dyer*, 18 (1927), No. 10, pp. 70, 71, fig. 1).—Simple methods are offered for the removal of spots from grease, furniture polish, ink, gum, and candle grease, and animal spots from rugs.

MISCELLANEOUS

Thirty-ninth Annual Report of [Kentucky Station], 1926, I. T. P. COOPER (*Kentucky Sta. Rpt. 1926*, pt. 1, pp. 36).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1926, a report of the director on the work and publications of the year, and meteorological data noted on page 14. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report [of Mississippi Station], 1926, J. R. RICKS ET AL. (*Mississippi Sta. Rpt. 1926*, pp. 39).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1926, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1926 [S. B. DOTEN] (*Nevada Sta. Rpt. 1926*, pp. 30, figs. 4).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, lists of station projects and publications, and a report of the director discussing the work and problems of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

[Annual Report of Porto Rico Insular Station, 1926], F. A. LÓPEZ DOMÍNGUEZ (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1926*, Spanish ed., pp. 62).—This contains the organization list and a report of the director for the fiscal year ended June 30, 1926, the experimental features of which are for the most part abstracted elsewhere in this issue.

NOTES

Florida University and Station.—The completion of a new horticultural building has permitted the transfer of the offices of the station director, the station library and herbarium, the extension division, and the offices of the department of animal industry from the station building, making the latter entirely available for station laboratories and offices and affording much needed additional space.

Results of preliminary tests conducted on the raw saw-grass peat of the Florida Everglades indicate that a great number of plants on this soil give marked response to applications of copper, caustic lime, manure, and manganese. The response to applications of 30 lbs. per acre of copper sulfate has been particularly striking. A bulletin reporting this work has recently been issued.

Seeds of the *Daubentonia*, or *Sesbania*, a plant commonly used as an ornamental shrub around Florida homes, have been found poisonous to chickens. Investigations by the veterinary department have shown that as few as nine of these seeds will result in death to a mature hen.

Iowa College and Station.—The contract has been let for the new \$500,000 dairy building. An insectary, especially for the study of the European corn borer, was also authorized by the legislature, and a section of the new horse barn and machinery shed has been completed. The old brick horse barn will be converted into a laboratory for the department of landscape architecture, while the old dairy building will afford much needed additional room for other departments in the agricultural division.

Louisiana Sugar Station.—J. F. Brewster, research chemist, has resigned to accept a similar position in the U. S. Department of Commerce Bureau of Standards.

Maine University.—The income from a bequest of \$100,000 from the late Thomas U. Coe of Bangor, which has recently become available, is to be used as a foundation for research. Projects bearing on the developing of the State are to be submitted by the faculty for approval under this fund.

Nebraska University and Station.—A herdsman's house is being built at the outlying experimental farm near the main station. Three units of a new greenhouse system are also under construction. Two of these are 28 by 100 ft. and one 12 by 100 ft., divided into compartments where various control conditions will be obtained and with a satisfactory head house.

At the North Platte Substation a shed 32 by 120 ft. is being added to the livestock equipment.

Francis M. Coe, instructor and assistant in horticulture, resigned September 1, 1927, and was succeeded by Warren W. Yocum.

Nevada University.—The Alice McManus Clark Memorial Library, presented by William Andrews Clark, jr., was formally dedicated October 21, 1927. The structure is of pressed brick with an inner wall of hollow tiling, the basement being of reinforced concrete faced with polished granite slabs. Completely fire-proof construction and unusually heavy framing with walls sealed by an asphalt-burlap layer against moisture characterize the construction. The

library building has been equipped by Mr. Clark with modern library facilities. Reference works on agricultural topics will be housed in the building as a part of the general working library of the university.

Ohio State University.—Data recently made public indicate that the average cost of educating a four-year student in the university is \$1,000 per year, of which about three-fourths is defrayed by the student and the remainder by the institution. Of the expenditures for education by the institution 79.4 per cent come from State appropriations, 12.7 from students, 4.7 from departmental earnings, 2.2 from the Federal Government, 0.5 from endowment, and 0.3 per cent from gifts. The expenditures for instruction comprised 63.9 per cent, buildings and other capital betterments 13.4, upkeep and maintenance 12.4, administration 3.8, library 3.6, and general expenses 2.8 per cent.

Pennsylvania College and Station.—A new course is being offered by the farm mechanics department on farm structures. This course takes up the requirements of farm buildings for housing the farm family and livestock and the storage of farm products and farm machinery.

Of an allotment of \$200,000 to the School of Agriculture for new buildings, \$150,000 is to be used for the first unit of a biology building, primarily for botany. The remaining \$50,000 is to be divided between a new sheep barn, an addition to the dairy barn milk room, a livestock hospital, and the first unit of a new poultry plant. The hospital is to be largely for the use of the dairy and animal husbandry departments. A demonstration room will be available for diagnosing and treating animal diseases and for student practicums.

The entering class in the School of Agriculture numbered 199, an increase of 7 over the previous year.

G. F. Rupp, assistant professor of forestry, resigned September 30, 1927. E. I. Wilde, head of the division of floriculture, has been granted a year's leave of absence for graduate work at Cornell University. Recent appointments include F. L. Bentley, professor of animal husbandry and animal husbandman, as head of the department on September 16; H. G. Niesley, professor of agricultural economics extension, as professor of agricultural extension on October 1; H. N. Reist, county agent in Warren County, as professor of agricultural economics extension on November 1; and H. N. Worthley, assistant professor of entomology extension, as assistant professor of economic entomology in the department of zoology and entomology on October 1.

Tennessee Station.—A new lysimeter installation has been added to the station equipment through a gift of W. M. Fulton, a former member of the staff. The new installation has a capacity of 149 tanks, and embodies ideas and improvements gained from the several installations made since the placing of the station's pioneer equipment about 18 years ago. The building is of reinforced concrete structure with granite-faced walls, Tennessee marble floors, and copper finish.

Virginia Station.—H. Farley, assistant animal pathologist, was transferred to other duties on October 1, 1927, and was succeeded on November 1 by L. E. Starr. Ilena M. Bailey has been appointed home economist, effective December 6, vice Ellen A. Reynolds, resigned October 7.

Land-Grant College Survey.—A special advisory committee to assist the Federal Bureau of Education in its survey of the land-grant colleges, discussed editorially on page 4 of this issue, has been appointed by the Department of the Interior. This committee consists of the Secretary of the Interior as chairman; the Secretary of Agriculture; President R. A. Pearson of the University of Maryland, representing the Association of Land-Grant Colleges and Universities; President R. S. Wilkinson of the Colored Normal, Industrial, Agricul-

tural, and Mechanical College of South Carolina, representing the conference of negro land-grant college presidents; Francis G. Blair, State superintendent of public instruction of Illinois; Presidents L. D. Coffman of the University of Minnesota, S. W. Stratton of the Massachusetts Institute of Technology, and C. A. Lory of the State Agricultural College of Colorado; and Miss Martha Van Rensselaer, director of the New York State College of Home Economics. A number of other organizations are also cooperating in the survey, including the American Veterinary Medical Association and the Association of Governing Boards of State Universities and Allied Institutions.

According to a recent announcement of the Bureau of Education "all of the lines of activity and interest and the relationships of land-grant colleges are being covered by the survey. This means that the work is being organized upon functional lines. Under this procedure specialists are being employed in each of the various fields of inquiry to complete detailed questionnaires upon their particular fields. Considerable progress has already been made in the preparation of these questionnaires, which will later be assembled, coordinated, and consolidated."

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 8, the following sectional officers were elected at the Chicago meeting, November 15-17, 1927: Agriculture, W. C. Coffey of Minnesota, chairman, L. N. Duncan of Alabama, vice chairman, and S. B. Doten of Nevada, secretary; engineering, M. S. Ketchum of Illinois, chairman, and R. A. Seaton of Kansas, secretary; and home economics, Jean Krueger of Michigan, chairman, and Margaret Whittemore of Rhode Island, secretary. In the three subdivisions of the section on agriculture, H. L. Walster of North Dakota and C. Betten of Cornell University were chosen as chairman and secretary, respectively, for that of resident teaching, H. W. Barre of South Carolina and C. P. Gillette of Colorado for experiment station work (with E. W. Allen of the Office of Experiment Stations as recording secretary), and J. R. Hutcheson of Virginia and S. B. Nelson of Washington for extension work.

In the standing committees, P. J. Kruse of New York, Anson Marston of Iowa, and Wylie B. McNeal of Minnesota were appointed for three years on the committee on instruction in agriculture, home economics, and mechanic arts vice Spright Dowell of Alabama, Alfred Vivian of Ohio, and Abby L. Marlatt of Wisconsin. G. W. Rightmire of Ohio succeeded C. A. Lory of Colorado on the committee on college organization and policy. The retiring members of the committee on experiment station organization and policy, J. T. Jardine of Oregon and E. W. Allen of the Office of Experiment Stations, were reappointed for three-year terms, as were also J. M. Thomas of New Jersey and A. G. Crane of Wyoming on the committee on military organization and policy. H. C. Ramsower of Ohio and L. N. Duncan of Alabama succeeded F. W. Peck of Minnesota and J. P. Campbell of Georgia on the committee on extension organization and policy. O. R. Jones of West Virginia was succeeded for three years by H. B. Shaw of North Carolina on the committee on engineering experiment stations.

On the joint committee on projects and correlation of research Henry Granger Knight, now of the U. S. Department of Agriculture, was succeeded as a station representative for a one-year term by F. B. Morrison of New York, with F. B. Mumford of Missouri reappointed for the three-year term. S. B. Haskell of Massachusetts was succeeded on the joint committee on publication of research by G. A. Dean of Kansas for a three-year term.

The special committee to give attention to the radio problem was reorganized and made a standing committee of the association. The complete membership of this committee consists of R. D. Hetzel of Pennsylvania, H. J. C. Umberger of Kansas, F. G. Helyar of New Jersey, D. C. Faber of Iowa, L. N. Duncan of Alabama, T. B. Symons of Maryland, and R. W. Goddard of New Mexico.

The special committees on Purnell research projects were continued with slightly reduced membership. Elizabeth E. Hoyt of Iowa and Greta Gray of Nebraska were added to the committee on rural home management studies, and P. E. Howe of the U. S. Department of Agriculture to that on factors which influence the quality and palatability of meat.

At the request of the U. S. Bureau of Education, committees were named to work with that bureau in its survey on the land-grant institutions. In the section on agriculture, there was named for the division on experiment stations J. T. Jardine of Oregon, W. C. Coffey of Minnesota, and M. J. Funchess of Alabama, and for extension, the committee on extension organization and policy together with the retiring chairman, F. W. Peck of Minnesota. From the engineering section there were named Anson Marston of Iowa, G. W. Bissell of Michigan, and R. A. Seaton of Kansas, and from the home economics section, Jean Krueger of Michigan, Ava B. Milam of Oregon, Margaret M. Justin of Kansas, Kathryn G. Van Aken of Illinois, and Mabel V. Campbell of Missouri.

Association of Official Agricultural Chemists.—Meeting as usual in Washington, D. C., this association held on October 31 and November 1 and 2 its forty-third annual convention, with an attendance which seemed rather better than that usually secured. The business of the association was carried out in accordance with the usual arrangement, though with somewhat more than the ordinary dispatch. The presentation of reports of referees and associates occupied, with occasional papers, most of the first and second days, while the third was taken up mainly with the committee reports.

Three addresses of general interest were given by the president, Dr. W. H. MacIntire of the Tennessee Station; Dr. Harvey W. Wiley, honorary president of the association; and Assistant Secretary of Agriculture R. W. Dunlap as the representative of the U. S. Department of Agriculture. The president's address consisted mainly of a brief summary of the lysimeter soil studies at the Tennessee Station, illustrated by lantern slides showing the construction and mode of operation of the newly designed lysimeter equipment recently installed at the station. Part of Dr. Wiley's address was in characteristic reminiscent vein, but he spoke especially of his deep interest in the economic difficulties confronting the farmer, proposing a somewhat unique plan of relief through Federal legislation. Assistant Secretary Dunlap expressed the appreciation of the Department of Agriculture for the work of the association, particularly in its elaboration and compilation of the *Methods of Analysis* as involving "a tremendous amount of work . . . done voluntarily, without thought of profit on the part of men and women engaged in public service."

The new officers of the association are as follows: President, Oswald Schreiner, U. S. D. A. Bureau of Chemistry and Soils; vice president, H. B. McDonnell of Maryland; secretary-treasurer, W. W. Skinner, U. S. D. A. Bureau of Chemistry and Soils; and members of the executive committee, W. H. MacIntire of Tennessee, F. C. Blanck of the U. S. D. A. Bureau of Chemistry and Soils, E. M. Bailey of Connecticut, and L. D. Haigh of Missouri.

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In the account of the Chicago convention of the Association of Land-Grant Colleges and Universities which last month appeared in these columns, the statement was made that "the interests of research were prominently but not dominantly before the convention and each of its sections." It is the purpose of the present article to amplify this statement, supplementing the brief observations previously made by a more extended discussion.

Although the convention program reveals no papers in the three general sessions specifically devoted to research, any seeming shifting of emphasis from it to other topics was of little significance. Many things were said regarding research in each of these sessions, and nearly every speaker paid tribute to it in greater or lesser degree. This was true of the address of the president of the association on the general theme of the convention, *The Solution of Present-Day Problems and the Contribution by Land-Grant Institutions*, and hardly less so in the paper of Dr. E. A. White on *The Relation Between Rural Electricity and Our Colleges and Universities*. It was particularly true of the address of Dr. A. F. Woods as the representative of the Secretary of Agriculture and of the report of the special committee on the agricultural situation.

Referring to the passage of the Purnell Act as an evidence of the recognition of the need of wider and more effective research in all aspects of country life, Dr. Woods drew attention to the long list of farm organizations which "have on their own initiative undertaken to develop a better understanding on the part of the public of the importance of promoting and providing for fundamental research as it relates to agriculture," and stated that a committee of these associations is actively at work with that objective. He discussed in some detail the efforts which the U. S. Department of Agriculture is making to promote research by segregating it as far as possible from regulatory and service activities, as indicated in the recent organization of the Bureau of Chemistry and Soils and the Food, Drug, and Insecticide Administration, and announced that a plan for extending this differentiation to other branches is under consideration.

An important section of the report of the special committee on the agricultural situation dealt with research and education, the conclusion being drawn that the agricultural situation "demonstrates the need of further agricultural research and of a broader education for the farmer and his family." It maintains that "programs of research carried on by these institutions should give growing attention to problems of land policies, marketing, farm incomes, costs of operation, consumptive needs, surplus production, and the standards of living of the farmer and farm laborer. Knowledge from these broad fields of investigation is necessary as a background for analysis of the problems of individual farms.

"Since the management of each farm constantly involves the direction of technical processes to secure the best result under the economic limitations encountered, the objective of agricultural research should be to supply such information concerning the operation of the farm as will enable each farmer to obtain the highest possible annual returns and at the same time to maintain agriculture in a prosperous and healthy balance with the economic activity of other industries. This implies providing information that will enable the farmer to select and combine wisely his crop and livestock enterprises, to select the best methods and practices in production, and to know the best time and place to market his products and the methods of marketing them. Attainment of this objective is possible only through possession of a fund of information that meets changing conditions and circumstances. It requires what may be considered as a continuous research service, made applicable to the particular conditions of various crop areas, and capable of interpretation by the individual farmer for application to his own farm."

In the opinion of the committee the large amount of research carried on by the experiment stations and the Federal Department of Agriculture to provide a basis for better methods for crop and animal production has given results which are "discernible in the improved practices of farmers. They have prevented the decline in producing power that would otherwise have followed the exhaustion of soil fertility and the effect of disease and of insect and fungus attack. Science, through research, has opened many new opportunities to agriculture and in the field of production it has proven its value. This field of research needs further expansion and continued emphasis, that agriculture may have a constantly improving basis upon which to build its economic activity." It is made clear, however, that the research should be "extended to cover such broad social questions as community health, housing and clothing, human nutrition, hours of labor on the farm, extent and result of family labor, and community activities."

Consideration of the more specific research problems naturally was centered in the various sections, and as usual largely in the section on agriculture. However, the section on engineering devoted a session to graduate engineering study in land-grant institutions and a single paper to the training of men for engineering research. A most encouraging development as compared with the previous year was the presentation of two papers on home economics research, one dealing with the development of such research and given before the research session of the section on agriculture, and the other discussing before the home economics group the progress with the Purnell funds.

The question of trends in agricultural research was discussed in some detail by Dr. E. W. Allen, Chief of the Office of Experiment Stations. As regards funds, the aggregate income of the stations was shown to have risen under the combined assistance of the Purnell funds and enlarged State support from \$7,660,570 in 1921 to \$12,191,267 in 1926. The general situation was deemed very gratifying, although a tendency was noted in some individual cases to reduce or even abandon State support because of the increased Federal appropriations. Such action, it was made clear, cancels the advantage accruing from the passage of the Purnell Act.

During the two years from the spring of 1925 to that of 1927, the number of station workers has increased from 2,362 to 2,852, or a little more than 20 per cent. A slight increase in the proportion of employees with advanced degrees was noted, and in the newer subjects of agricultural economics, home economics, and rural sociology it was found that approximately half had attained the master's and over one-quarter the doctor's degree. Obviously too much emphasis should not be placed on academic ratings, yet the increasing proportions of the recent appointees in all subjects who have received advanced degrees is deemed an encouraging indication of more thorough preparation.

Although the total number of full-time workers in the stations has shown little increase and approximately one-half of their staffs continue to have other duties, the proportion of new appointees and those prominently connected with research who are free from teaching and extension work has grown considerably, making the total man power of the stations greater than the increase in the number of workers would indicate. Dr. Allen also reported a "decidedly more sympathetic and understanding attitude toward the stations in the amount and adjustment of other duties," including a "very marked trend in the direction of lightening the teaching load and arranging teaching schedules so as to minimize interruption from that source." More discrimination is also being exercised in assignments to station work. This is a recognition, not always obtaining

in the past, that if the station work "is to be productive, original, progressive, it requires persons of training and special ability, with opportunity to concentrate and to put their research ahead of anything else."

These developments as regards conditions for research Dr. Allen finds to have been accompanied by a stimulation far beyond the number of projects and a gain in the motive and manner of approach.

"There is noticeably less of blind groping; more of purposeful, directed searching. And beyond this we are learning not only better to understand and interpret things that lie before us, but to conceive and to measure things that have been out of reach. This is a long step, not only in its practical possibilities but in helping our minds to grow."

Some of the ways in which the stations may aid in remedying the present agricultural situation were brought out in the section programs, and notably in the paper of Director C. G. Williams of Ohio. Fundamentally Director Williams believed the functions of the stations to be those of fact-finding agencies, their studies to include the discovery of causes and the suggestion of remedies. Among the problems needing investigation by impartial institutions, he included the whole question of relative production and consumption of farm products, taxation and the cost of road construction and upkeep, the leakage of youth from country to city, the effect of the tariff on agriculture, the disposition of American farm products abroad, the relative efficiency of American and European farm labor and of American farm labor now and a decade ago, the supplementing of soil surveys by ecological studies, and suggestions as to readaptations of the farm enterprise. The ensuing discussion brought out some doubt as to the propriety of some of these topics for station inquiry, as well as some of the difficulties which might be encountered in the investigation of others, but indicated quite clearly a belief in a real responsibility of the stations for constructive service in many directions not yet fully entered upon.

An address of Prof. Eric Englund of the U. S. Department of Agriculture dealt especially with the place of economic research in the solution of present-day agricultural problems, showing the relation of such research to the efforts of individual farmers, joint efforts of farmers through cooperative organizations or other associations, and governmental policy expressed through laws and public institutions. The majority of the present-day problems Professor Englund believed must be solved by the individual farmer, but he considered that more help can well be afforded him in looking ahead and securing his most advantageous combination of land, labor, and equipment. As regards studies of cooperative enterprises, he found a general

trend toward a more and more thorough study of particular problems, and stated that the goal sought by farmers in cooperative effort "will be reached, if at all, with the guidance of research, in which the results of each specific project are brought together into a growing body of knowledge of cooperative business organization and procedure." In the sphere of governmental effort, the need of a detachment of mind, an obliteration of sharp boundaries between agricultural economics and other fields of economic investigation, and freedom from prejudices and sentiment were deemed peculiarly essential, and a number of the leading problems of the day were examined somewhat critically from this broad point of view.

In conclusion Professor Englund drew attention to the dangers of the "hasty touch-and-go method" of procedure, fostered by "impatience for printed evidence of accomplishment." In his opinion "research workers in farm economics have something to learn from the methods and aims developed in the older sciences. There is already a trend toward greater definiteness of aim and method in the newer field. Hasty surveys are becoming less popular, and where undertaken are considered as preliminary steps to more specific projects in a broad research program. Such a program should be sufficiently elastic to allow room for studies of longer or shorter duration to meet new problems, and at the same time give to research a greater continuity of effort and more definiteness of purpose. Such a program should yield a continuous flow of timely information helpful to the individual farmer, to cooperative organizations, and to public policy."

Other problems pertaining to the newer lines of work found extended treatment in several papers. One of these dealt with the development of research in rural sociology. Its author, Dean C. C. Taylor of North Carolina, traced the early history of this research and the steady progress in formulating standard types of projects and improving the quality of the research despite a serious shortage in trained personnel. Among the questions needing special attention, he cited the sociological aspects of the agricultural situation and particularly the discontent caused by the shrinkage in standards of living maintainable since the period of war prosperity. Fuller knowledge is urgently needed, he believed, of rural standards of living as an index to farm life, rural population trends, rural organizations, and of special significance studies, mainly psychological, of the thinking of farm people. The ensuing discussion brought out the fact that this last topic was also one of particular relevance in home economics studies.

The handicap to research development resulting from inadequately trained personnel was referred to as regards home economics by Dr. Louise Stanley, head of the U. S. D. A. Bureau of Home Economics,

who spoke of it as resulting in a vicious circle by decreasing the opportunities open to investigators and so discouraging special training for a research career. Despite other difficulties confronting home economics research, she believed that distinct progress is being made in the transition of the subject from its beginnings as an art, and that it is "gradually becoming a coherent field of knowledge." Special mention was made of the assistance which had been rendered by the American Home Economics Association and other organizations in this development.

Additional information as to the status of research in home economics under Purnell funds was presented in the paper of Miss Sybil L. Smith of the Office of Experiment Stations, largely on the basis of records of projects approved for the current fiscal year and correspondence and numerous visits to the stations. The data indicate that while research in home economics received Federal support at only four stations prior to the passage of the Purnell Act, 85 projects are now in progress in 39 States under the home economics label, and in several others research having a direct bearing on human nutrition is under way in departments of chemistry. The average Purnell allotment in the 39 States is \$5,408, or 13.52 per cent of the total appropriation of \$40,000 per State, while in 4 States, Florida, Mississippi, New York, and Texas, 25 per cent or more of the Purnell funds is being so allotted. Other sources of encouragement were seen in the relatively high proportion of workers with advanced degrees, and the increasing facilities for the publication of home economics research, such as the recent opening to it of the columns of the *Journal of Agricultural Research* and the tentative addition to the *Journal of Home Economics* of a department for the publication of scientific investigations.

Many of the administrative problems still needing consideration were indicated by Miss Smith in the form of a series of questions. Among these she stressed the advantages of full cooperation with older research departments, the safeguarding of workers from the pressure of other duties, and especially the responsibility of heads of home economics departments for the future of this research by a search for and recognition of prospective talent among their students. It is of interest to recall that much the same conclusions as to the need of encouraging potential researchers were brought forward by Dean and Director E. C. Johnson of Washington in his paper, discussed last month, on the best type of education for station workers in general. The point was also emphasized in the discussion from the floor, and is evidently becoming more and more widely appreciated.

Another topic in which considerable interest was evidenced by the discussions was brought up in a paper by Dean and Director W. C. Coffey of Minnesota on the extent to which research problems should

be predicated upon extension experience. Dean Coffey recalled that in the early days the stations naturally selected their problems quite largely on the basis of the farmers' immediate needs, and that field contacts are still necessary if the station personnel is to avoid the danger of being too sheltered and too devitalized. The extension service and especially its subject matter specialists can be of much help in this connection, but it was not established, as he put it, to be "eyes for the station," and the latter can not shift its responsibility. The most effective service may be expected when research and extension activities cooperate and profit by each other's experience, and the key to the problem is, as was expressed by Dean and Director L. E. Call of Kansas, to be found in cordial relationship between the two agencies.

The reports of the three standing committees of direct interest to research took up a number of matters of general importance. President R. W. Thatcher of Massachusetts reported for the joint committee on publication of research marked progress in relieving the congestion of manuscripts awaiting publication in the *Journal of Agricultural Research*. He pleaded especially for a more searching examination of manuscripts by station directors prior to their submission for publication, and drew attention to the successful results in some institutions by the designation of one or more staff members to assist in this scrutiny.

The report of the committee on experiment station organization and policy, presented by Director J. T. Jardine of Oregon, dealt with the need of more critical study of projects, the relation of the nine months' college year to station salary adjustments, and the disposition of inventions and discoveries resulting from station work. On the first of these points the committee strongly recommended increased attention to the formulation of projects. In its opinion, titles should be specific, objectives clean cut and tangible, the outlook reasonably indicative of ultimate success, the procedure up-to-date and adequate, and there should be freedom from fragmentary or superficial tendencies, a reasonable time limit, and assurance of sufficient funds to bring the project to completion.

The committee was equally definite as to the need of a general policy of station employment on a 12-month basis, with one month's vacation and such salary adjustments as would be necessary to equalize conditions elsewhere in the institution. A limitation of part-time work where other arrangements may be readily substituted was also advocated.

On the question of patents, the committee took the ground that the interests of the general public should be safeguarded by requiring the assignment to the stations of patents, both domestic and foreign, when obtained by members of their staffs. In cases where

the new appliances or processes can be developed profitably only by a single concern, the policy suggested was that of patenting by the station and licensing the manufacture.

Perhaps the committee report of most general interest was that of the joint committee on projects and correlation of research, presented by Dean and Director F. B. Mumford of Missouri. This report traced the steady development of interinstitutional cooperation, its records indicating no fewer than 630 cooperative research projects now in existence, involving ten bureaus of the U. S. Department of Agriculture and all but one of the experiment stations. Approximately 10 per cent of all station projects, it appears, are being carried on in cooperation either with the Department or between the stations themselves. At least 21 of these projects are regional studies.

Some difficulty was met in securing the data necessary for this compilation, the cooperation in some cases being on an informal basis with oral agreements or correspondence as its basis rather than definite memoranda. The committee accordingly suggested the desirability of the maintenance by each Department bureau and each station of a special file or record of the cooperative projects for convenient reference, and reiterated an earlier recommendation that project titles be "sufficiently definite to characterize the nature and field of work under them, with subtitles or brief explanations when necessary."

The activities of the national committees on special Purnell projects were described, notably as to the success attained by several of these committees in enlarging the amount of cooperation, analyzing their problem, developing methods of procedure, and otherwise organizing their respective enterprises. The question was raised, however, whether a larger measure of actual cooperation may not still be effected without interference with local initiative and freedom. "One strength of our system for agricultural investigation in this country is the large number of separate units. These are distributed over the entire country and the islands of the sea, and each has its own special problems, its particular environment, and its other modifying factors, and each is concerned in problems which are general or apply to a wide region. This gives a community of interest and a substantial basis for cooperation and coordination looking to making the work of each institution and each individual contribute in the largest degree."

How to accomplish this effectively and develop cooperative-mindedness without too much formal machinery, and especially in the large cooperative studies so to plan the research that it will be conducted on a comprehensive systematic plan, is as the committee states a matter which still deserves studious attention. More study is advocated in mapping out cooperative studies with the assistance of

subject matter committees and other agencies and the increasing of contacts between cooperators. "The committee is inclined to believe that work conferences of groups engaged on particular phases of the national cooperative problems are desirable, when called for such purposes as the organization of the field and the research, coordination of plans and methods, and comparison of results. To be constructive, experience shows that such conferences should be based on a quite definite program and should look to some conclusive action or decision which will promote the cooperative advancement of the study."

On account of the expense, the committee maintains that such conferences should be called advisedly and only as there is special need to consider important matters which can not be arranged through correspondence. Annual or other meetings at stated times, for the less definite purpose of getting together, are not favored or considered justified. Nor does it seem practicable to the committee "to undertake, through such conferences or series of meetings, to inculcate in workers the spirit of investigation, the nature of problems and approach to them, or the methods and technique to be employed. In a general sense these should be a part of the equipment of mature investigators. Such conferences can hardly undertake the functions of a scientific society or an organization for general enlightenment and criticism. The committees are not designed to promote research in general, but that upon the projects singled out for cooperation. Similarly, it is not conceived to be their function to deal with methods in general, but rather those pertaining to the special subjects in their charge." It is pointed out, however, that other agencies are interesting themselves in this broader field, working particularly through advisory committees sponsored by subject matter associations and related institutions. This development, which thus far has been most noticeable in agricultural economics and rural sociology, is highly commended by the committee, and its extension to other sciences is predicted.

Not the least valuable feature of the 1927 meetings was the large amount of discussion from the floor of the various papers pertaining to research and its interests. This feature was especially noticeable in the session of the experiment station division, despite the limited time at its disposal. Under the new program arrangement which was authorized this time may be doubled at future meetings, and if this is done, much greater opportunity may be afforded for the interchange of experiences and views than has been possible in recent years. This should be very helpful, for perhaps the station division meetings render no more useful service than in bringing together the administrative heads of the agricultural research work for conference on their common problems. The value of the meetings is therefore increased as the extent of participation is enlarged.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on glutelins.—I, The α - and β -glutelins of wheat (*Triticum vulgare*), F. A. CSONKA and D. B. JONES (*Jour. Biol. Chem.*, 73 (1927), No. 1, pp. 321-329).—The fact that the precipitation of proteins by ammonium sulfate has purely a salting out effect, and is not due to a change in pH, having been established in a previous study (*E. S. R.*, 55, p. 801), the present work was undertaken to ascertain between what limits, if at all, wheat glutelin would be precipitated by ammonium sulfate from solution in 0.2 per cent sodium hydroxide. Though the vegetable globulins are precipitated at ammonium sulfate concentrations ranging from 0.8 or 0.9 of saturation to a lower limit of about 0.15 of saturation, it was found that most of the wheat glutelin contained in the 0.2 per cent sodium hydroxide extract from gliadin-free gluten could be precipitated by the addition of as little as from 0.018 to 0.02 of the saturation.

By applying this precipitation procedure to wheat glutelin extracts, two glutelins were obtained, the first a larger fraction designated the α -glutelin, separating at 0.018 to 0.02 of saturation with ammonium sulfate, and the second a very small fraction designated the β -glutelin and precipitated only when the extract was made 0.16 to 0.18 saturated with the precipitant salt. The elementary percentage compositions of these preparations in so far as they were determined were: α -glutelin, nitrogen 17.14; β -glutelin, nitrogen 16.10 to 16.03; α -glutelin, sulfur 1.59; and β -glutelin, sulfur not determined. The basic amino acids as determined from the nitrogen distribution data obtained by the Van Slyke method (*E. S. R.*, 26, p. 22), were, for the α -glutelin, cystine 3.25, arginine 5.83, histidine 3.48, and lysine 2.76 per cent; for the β -glutelin, cystine 7.49, arginine 3.05, histidine, 3.67, and lysine 5.75 per cent. The isoelectric points of the two glutelins were identical at pH 6.45, the determination having been made from the buffer solution solubility data (*E. S. R.*, 55, p. 801).

Studies on glutelins.—II, The glutelins of rice (*Oryza sativa*), D. B. JONES and F. A. CSONKA (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 427-431).—Continuing the studies noted above, the authors report a study of the glutelin of the rice kernel. Like the various authors mentioned in the introductory review of the literature, they find but one glutelin in this seed, but the percentage of nitrogen was found to be higher than those reported by the majority of the previous investigators, as was also that of the amino acid cystine as determined from the Van Slyke (*E. S. R.*, 26, p. 22) nitrogen distribution data. The nitrogen distribution is given, together with the percentages of the basic amino acids as calculated from these data, the hexone base figures being as follows: Arginine 11.13, histidine 2.39, lysine 4.73, and cystine 2.35 gm. The isoelectric point of this rice glutelin as determined from the solubilities and buffer solutions (*E. S. R.*, 55, p. 801) was found to be pH 6.45. The rice glutelin precipitated from its 0.2 per cent sodium hydroxide solution at 0.83 saturation with ammonium sulfate.

The globulins of rice, *Oryza sativa*, D. B. JONES and C. E. F. GERSDORFF (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 415-426).—Briefly reviewing the literature, the authors show that but little work has been done, in comparison with that which has been expended upon the proteins of other cereals, on the proteins of the rice kernel. This is considered due in part at least to the unusual class distribution of the proteins of the rice kernel, nearly all of the endosperm protein being insoluble in either water, saline solutions, or alcohol.

The work reported in this paper is concerned primarily with the proteins soluble, without the use of alkaline extractants, from white rice (the unpolished seed of *O. sativa*, Blue Rose variety, Louisiana crop of 1924, from which all of the seed coats and the embryo had been removed); and, more especially, with two globulins extracted in maximum yield by 5 per cent aqueous sodium chloride. These globulins could not be separated by the usual method of fractional precipitation with ammonium sulfate, both of them precipitating together at about 0.3 saturation with that precipitant. Dialysis either of the saline extract or of a solution of the protein precipitated by ammonium sulfate also threw down both globulins at once. Their coagulation points, however—74 and 90° C., respectively—were found far enough apart to permit of the separate isolation of coagulated preparations. The fractions coagulating at 74° and at 90° amounted, respectively, to 0.09 and to 0.07 per cent of the meal extracted.

The globulin coagulating at 74° (G-1) had the following percentage elementary composition: Carbon 52.83, hydrogen 6.77, nitrogen 16.31, and sulfur 0.98; while the globulin coagulating at 90° (G-2) showed the percentages carbon 49.15, hydrogen 7.86, nitrogen 17.94, and sulfur 1.45. G-1 contained the following percentages of basic amino acids as determined from the nitrogen distribution data obtained by the Van Slyke method (E. S. R., 26, p. 22): Cystine 2.25, arginine 7.85, histidine 2.42, and lysine 7.14. For G-2 the percentages were cystine 2.89, arginine 15.18, histidine 3.01, and lysine 3.63. Tryptophane was also determined in both the globulins by the method of May and Rose (E. S. R., 48, p. 312) as modified by Jones, Gersdorff, and Moeller (E. S. R., 52, p. 802), 2.69 per cent of this amino acid being found in G-1 and 2.32 per cent in G-2. The tyrosine content, determined with the cystine by the colorimetric method of Folin and Looney (E. S. R., 47, p. 504), was found to be 5.60 per cent in G-1 and 7.53 per cent in G-2. The elementary analysis and the cystine, tryptophane, and tyrosine contents of a globulin fraction from white rice are also given, together with elementary analysis of albumin and globulin preparations from prepared rice bran. No protein having the properties of a glutelin could be isolated from the bran.

The behavior of the prolamins in mixed solvents.—III, The denaturation of wheat gliadin, M. J. GOTTENBERG and C. L. ALSBERG (*Jour. Biol. Chem.*, 73 (1927), No. 2, pp. 581-586).—Continuing the work of Dill and Alsberg (E. S. R., 54, p. 610), the authors find that weak alcohols, from 20 to 30 per cent by volume, alter the solubility of gliadin at low temperatures, and that 80 per cent alcohol also induces changes. At intermediate concentrations of alcohol, however, very little alteration takes place even at high temperatures. The method used to detect alteration in the solubility of the gliadin consisted in the determination of the "critical peptization temperature" of its solutions, the C. P. T. being defined as the temperature at which the first signs of turbidity appear in a solution of gliadin in an alcohol-water mixture when the solution is slowly cooled.

A laboratory study of nitrogen fixation by the high tension arc, P. G. COLIN and H. V. TARTAR (*Jour. Phys. Chem.*, 31 (1927), No. 10, pp. 1539-1558,

figs. 11).—The literature of the experimental arc fixation of nitrogen is reviewed in an historical introduction, some 25 previous investigations being cited. Experiments on fixation in arcs operated at voltages from about 370 to about 2,300 volts with the exception of a single experiment at an approximate voltage of 4,460, are then reported, together with data on the effects of variations in current, voltage, power, pressure, composition of the nitrogen-oxygen mixture, and the rate of gas flow through the arc.

It was found that reduced pressure caused decreases both in the concentration of nitric oxide and in the actual yield of fixed nitrogen per kilowatt hour; that the maximum equilibrium concentration of nitric oxide over a wide range in pressure was dependent upon the current; that there was little effect upon the equilibrium concentration of nitric oxide produced by varying the velocity of the gases; that at reduced pressure under appropriate conditions high concentrations of nitric oxide could be produced in an uncooled high tension, electric arc; that maximum concentrations, under the conditions described, of 8.8 per cent for air, 12.2 per cent for invert air, and 13.1 per cent for equal volumes of oxygen and nitrogen could be obtained at a pressure of about 100 mm. of mercury; that the law of mass action holds approximately for the reaction between nitrogen and oxygen in the high tension electric arc at pressures greater than 0.5 atmosphere; and, finally, that the water-cooling of the gases after they leave the arc was not found necessary.

The drying of colloidal liquids, especially milk, C. KNOCH (*Das Trocknen Kolloidaler Flüssigkeiten insbesondere der Milch. Berlin: Paul Parey, 1927, pp. VIII+226, figs. 75*).—This is a critical discussion of the apparatus for the large scale drying of fatty and proteiniferous liquids, described in the general literature and in the patent literature. The greater part of these devices have not been tested in actual practice by the author, but are judged upon the basis of their suitability for the purpose of the preservation of the original characteristic properties of the substances treated. Further, the larger number of the apparatus and processes are considered from the viewpoint of their suitability specifically for the drying of milk, not only because of the special composition of milk and its exceptional tendency to rapid decomposition, which make it most difficult to work with, but by reason also of the great importance of preserving the original properties in the dried substances. Apparatus capable of producing a suitable and readily soluble whole milk powder free from defects is also capable, in the author's opinion, of drying any other fatty and proteiniferous colloid solution to a final product retaining all the chemical, biological, and therapeutic properties possessed by the substance in its original dissolved state. The main portion of the book, the drying of milk by heat, is subdivided into sections on intermittent drying upon stationary, limited heating surfaces; continuous drying on moving heating surfaces; and spray drying. There is also an appendix on apparatus and processes which appeared while the book was in press; and a list of the patents (mostly German) noted in the text.

A densimeter for the rapid determination of the specific gravity of small quantities of liquids and solids, P. L. DU NOÛY (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 443-448, pl. 1, figs. 2).—The instrument described is essentially a torsion balance fitted with a dial and vernier, and provided with a bob for use with liquids and a scale pan for coarse or powdered solids. The instrument is of the direct reading type, and measurements accurate to the third decimal place may be made with 1 cc. of a liquid in a few seconds.

An electrolytic method for the determination of sodium plus potassium, J. L. STODDARD (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 677-688, figs. 2).—An

electrolytic method and apparatus are described. The material is first ashed and dissolved, and the calcium and magnesium removed, when a part of the remaining solution is electrolyzed in a simple apparatus consisting essentially of one test tube fused inside another, with mercury in each tube and a passage through the wall of the inner tube. An E. M. F. of 110 volts was used, the separated sodium and potassium amalgamating with the mercury in the inner tube, so that this amalgam could be removed at the end of the operation and titrated. Full details for the construction and manipulation of this apparatus are given, together with data tending to substantiate the claims made for its accuracy.

A rapid approximate method for determining soil organic matter, C. J. SCHOLLENBERGER (*Soil Sci.*, 24 (1927), No. 1, pp. 65-68, fig. 1).—Noting the frequent desirability of an estimate of the soil organic matter more accurate than a mere guess derived from the color and texture of the soil, in cases such that the determination by the standard methods is not justified, the author offers, on the basis of experiments carried out at the Oregon Experiment Station, the following procedure, which he finds capable of being completed in 10 minutes and of furnishing useful estimations.

Solutions required.—Pulverize 20 gm. of pure potassium dichromate, add slowly with constant stirring to 1 liter of concentrated sulfuric acid. Let stand for at least 1 week, closely stoppered, and decant the clear solution from the insoluble matter into a glass-stoppered bottle. Prepare $N/5$ ferrous ammonium sulfate by dissolving 39.3 gm. of the salt in water containing 10 cc. of concentrated sulfuric acid and make up to 500 cc. Prepare a diphenylamine indicator by dissolving 0.5 gm. of the dye in 100 cc. of concentrated sulfuric acid and pour carefully into 20 cc. of cold water.

Procedure.—Weigh 0.5 gm. of air-dried and finely crushed soil, place in a large dry Pyrex test tube. Add from a pipette 10 cc. of chromic acid solution, washing out any particles of soil from the sides of the tube with the acid. Heat over a low flame, stirring constantly with a thermometer to 175° C., during about 90 seconds. Cease heating at once. Allow the tube to cool 1 minute in air, then cool with water. Pour the cooled solution into 150 cc. of tap water in a 400-cc. beaker. Fill the tube twice with tap water, emptying each tubeful into the beaker. Add a few drops of the diphenylamine indicator, producing a deep blue color. (The color often appears, however, only after the titration is started.) Titrate with the iron solution until the blue fades to a muddy greenish blue, which is the proper end point. Deduct the reading from that secured in a blank experiment without the soil sample. If only 1 cc. of the iron solution is required in the titration, it is advisable to repeat the titration with a smaller sample. It is advised that each worker standardize the organic matter value of his solutions by determinations on soils of known organic carbon content.

A graph showing for 10 samples the relation between chromic acid reduction and organic carbon, as determined by the combustion-furnace method, shows a close agreement between the two methods, though the Kjeldahl nitrogen figures fall further from the straight line which very nearly represents the graph position of the carbon content points as found by the two oxidations. Further confirmation of the accordance of the short with the standard method is given by the analysis of a muck soil of a known carbon content of 13.40 per cent, which gave 15 per cent by the short method; a fine sand containing 1.33 per cent of carbon, which gave by the short method 1.3 per cent; and black clay of the known carbon content of 3.53 per cent, which was found by the short method to contain 3.6 per cent. It is noted that some highly abnormal soils, such as

those containing oxidizable mineral matter, could not be examined by this method. It is considered, however, that such soils are probably rare.

The determination of lactic acid, T. E. FRIEDEMANN, M. COTONIO, and P. A. SHAFFER (*Jour. Biol. Chem.*, 73 (1927), No. 1, pp. 335-358, fig. 1).—The method described consists essentially in the oxidation of the lactic acid to acetaldehyde by permanganate (*E. S. R.*, 24, p. 213), with the aeration of the aldehyde into a large excess of sodium bisulfite and subsequent titration of the combined bisulfite, as described by Clausen (*E. S. R.*, 47, p. 716). The principal modifications are in the form of the apparatus used for the oxidation and for the collection of the aldehyde, the addition of manganous sulfate as an oxidation catalyst, and the more accurate definition of the conditions for the titration of the aldehyde-combined sulfurous acid. By the modified procedure here given, consistent yields of from 96 to 98 per cent of the theoretical quantity of aldehyde were recovered. The interfering action of about 50 substances was studied.

A condenser unit for use in the determination of lactic acid, H. A. DAVENPORT and M. COTONIO (*Jour. Biol. Chem.*, 73 (1927), No. 1, pp. 359-361, fig. 1).—The apparatus described, for the details of which the drawing presented with the original text must be consulted, is an optional variation in the device of Friedemann, Cotonio, and Shaffer, above noted. Multiple units of the apparatus can be relatively more compactly arranged than by the use of the Hopkins' condenser included in the original design.

Utilization of the phenomena of fluorescence in the analysis of food substances [trans. title], J. VOLMAR (*Jour. Pharm. et Chim.*, 8. ser., 5 (1927), No. 9, pp. 435-443).—Using a direct current mercury vapor arc, with Wood's nickel oxide filters to exclude visible light, the author found various food substances fluorescent, the shade and intensity of the luminescence being sufficiently characteristic in many cases to permit of the use of such a method for their identification and the detection of adulterants. Completely skimmed milk shows no fluorescence, but cream and unskimmed milk are luminescent under ultra-violet light, with a yellow shade.

It is considered that any milk or cream not showing this phenomenon with normal intensity is to be suspected of adulteration. Milk fat in cheese may be similarly regarded. Butter shows under this irradiation only a scarcely visible yellowish fluorescence, while margarine gives a bright indigo-blue luminescence. Fifty per cent margarine in butter shows as bright a fluorescence as does pure margarine, but below 50 per cent the effect diminishes proportionately to the decreasing margarine content down to 10 per cent. Below this point direct observation was difficult, but the spectroscope still showed a faint line in the blue.

Of particular interest are the results with vegetable oils, for which the following fluorescences are recorded: Olive oil, a weak yellowish, to greenish yellow; cottonseed oil, an intense violet; peanut oil, an intense indigo; poppyseed oil, strong blue; sesame oil, an intense indigo; and oil of sweet almonds, a strong indigo. From 10 to 15 per cent of seed oils added to olive oil is sufficient to bring out the characteristic blue violet luminescence in contrast to the feeble yellow of pure olive oil.

Potato and barley flours were found nonluminescent, but wheat and rye flours exhibited bluish shades. More than 15 per cent of flours other than rye flour so far diminished the fluorescence when added to wheat flour that by comparing the suspected product with samples of known composition adulteration could be detected. Alimentary pastes showed the same effects as did the flours from which they were made, but the addition of eggs to the extent

of about two to each pound of the flour suppressed the fluorescence. It is considered that alimentary pastes made without eggs or with an insufficient proportion should be detectable by the presence of the characteristic fluorescence.

Salicylic acid and benzoic acid gave violet and bluish luminescences respectively, their sodium salts showing in each case a much stronger effect. The effect with saccharin was a feeble white luminescence, the sodium salt, however, giving an intense violet. "Abrastol" (calcium β -naphthyl sulphate) may be extracted, decomposed, and converted into its sodium salt, which shows a bright blue fluorescence under ultra-violet light. The β -naphthol itself, however, is not fluorescent.

The copper number for glucose, C. A. AMICK (*Jour. Phys. Chem.*, 31 (1927), No. 10, pp. 1441-1477, figs. 4).—Defining the copper number as the number of milligrams of copper precipitated as cuprous oxide from an alkaline solution of a copper salt by a unit quantity of the organic reduction, this paper reports a rather extensive experimental and theoretical study of the reduction of alkaline copper solutions by glucose, with, in part, the following conclusions:

The use of alkaline copper solutions for the estimation of glucose is valueless because (1) the amount of the oxidation is dependent upon the alkalinity of the solution, and (2) the method may be made to give any concordant results which one desires, using from one to five atoms of oxygen for each molecule of glucose. Solutions made alkaline by carbonates gave higher copper numbers than those using free alkali, which result it is considered may be due to carbonate buffer action and an alkalinity too low to permit the formation of lactic acid. The reducing action of the glucose molecule is found not to be due to carboxyl formation from the carbonyl group, the fact that the oxidation of the carbonyl to the carboxyl stabilizes the molecule, preventing further oxidation, is noted, and the conclusion is drawn that the formation of gluconic or of saccharic acid as an intermediate step in the oxidation process is therefore precluded.

Bertrand's volumetric method is considered inaccurate for the two reasons that (1) the asbestos mat or filter paper adsorbs some of the Fehling solution, which can not be removed by subsequent washing, but which is removed by the acidified iron alum solution, and (2) the ferric salts catalyze the oxidation of the adsorbed tartrates by the permanganate. The employment of iron salts under certain conditions was found possible, however, by using sodium fluoride to remove the excess ferric ions. A complex is said to be formed which has the formula Na_2FeF_6 , and is unstable in solutions of 2.5 per cent or higher acidity.

A new volumetric method for the estimation of glucose employing alkaline copper oxide, by which it is possible to eliminate filtration, is given. A phosphomolybdic reagent is used to oxidize the cuprous oxide, and the blue molybdenum color is titrated to a colorless end point with cold permanganate in this method, for the details of which the original must be consulted.

METEOROLOGY

Periodical fluctuations of precipitation in Russia and central Siberia and sun spots [trans. title], W. B. SCHOSTAKOWITSCH (*Met. Ztschr. [Brunswick]*, 44 (1927), No. 9, pp. 347-355, figs. 4).—The author concludes, as a result of the investigation here reported, that there is a relation between fluctuations in precipitation and sun activity (sun spots), the precipitation having the same periodical variations as the sun spots. The length of these periods of variation are 33.33, 11.13, 8.34, and 4.77 years. The precipitation maxima and minima generally occur at the same time as the sun-spot maxima and minima. In tropical oceanic regions this relationship is reversed. The practical value of these results for forecasting is indicated.

Influences of sun rays on plants and animals, C. G. ABBOT (*Smithson. Inst. Ann. Rpt. 1926*, pp. 161-173, pls. 5, fig. 1).—The present status of knowledge and investigation on this subject is reviewed, special reference being made to some of the more striking results of the work of the Boyce Thompson Institute, Garner and his associates of the U. S. Department of Agriculture, the Maine and Wisconsin Experiment Stations, and Rollier in Switzerland.

Ecology and crop production on the Great Plains, H. C. HANSON (*Ecology*, 8, (1927), No. 4, pp. 487-489).—This is a review of the work by Chilcott (E. S. R., 56, p. 730), J. E. Weaver, F. E. Clements, H. L. Shantz, and others, bearing on the basic relations between ecology and the utilization of the Great Plains.

SOILS—FERTILIZERS

Farm soils: Their management and fertilization, E. L. WORTHEN (*New York: John Wiley & Sons; London: Chapman & Hall, 1927*, pp. X+410, pl. 1, figs. 199).—This is a textbook on the selection and management of agricultural soils, in which the primary emphasis is placed, as stated in the preface, on "what to do and how and when to do it," though the purpose of developing an interest in the information upon which the practice is based has not been neglected, the informational material being given under the heading of "general information," at the end of each chapter. In the introductory chapter on the selection of a soil and the planning of its management, it is recommended that selection be based upon topography and drainage, the character of the surface soil, the character of the subsoil, the chemical composition if available, the vegetative growth, and, finally, upon the soil survey reports. The general information section of this chapter gives an elementary introduction to the scientific classification of soils, to such elements of chemistry as are essential to effective soil management, and to the subject of plant food supply. The remaining chapters are entitled Growing the Crop; Controlling the Water Supply of the Soil; Tilling the Soil; Manuring; Liming; Fertilizing; "Leguming" and Green Manuring; Managing Field Soils; Managing Pasture Soils; Managing Garden and Lawn Soils; and Managing Fruit Soils.

A suggestion for uniformity and utility of data in soil solution analyses, W. B. BOLLEN and R. E. NEIDIG (*Soil Sci.*, 24 (1927), No. 1, pp. 69, 70).—Much confusion is noted in the literature with respect to units in which analytical data on soil solutions are expressed, different forms of expressions not infrequently appearing in the same article. The uniform use of milligram equivalents per liter is, therefore, recommended.

Lysimeter studies, W. M. HIGBY (*Soil Sci.*, 24 (1927), No. 1, pp. 51-56).—The soils used in this study contributed from the Oregon Experiment Station were (1) Willamette silt loam, a soil of rather heavy texture though of open structure, which had a well-developed drainage and good productivity, and (2) Dayton silty clay loam, a heavy soil with restricted drainage, low productivity, and a compact layer below the surface horizon. Portions of soil from each 6-in. layer were packed in lysimeters, each in its natural position and volume, four tanks having been filled in 1921 with each of the two soils mentioned. The tanks were planted first to oats and subsequently to barley, clover, barley, vetch, and vetch. Determinations of the plant nutrients were not begun until three years had been allowed for the settling of the soil.

It was found that the first percolate approximated, under moderate weather conditions, the composition of a displaced soil solution. Lime and manure, alone and in combination, increased the total leachings and the plant nutrients calcium, magnesium, nitrogen, sulfate, and potassium. The largest nutrient loss was that of the calcium ion, calcium having been leached at the aver-

age rate of 65 to 70 lbs. per acre per year. Nitrate losses amounted to from 25 to 30 lbs. per acre per year, the losses being nearly doubled by lime and manure treatments. The normal sulfate loss was about 50 lbs. per acre per year, increased by liming. The magnesium and potassium losses were 23 and 16 lbs., respectively, per acre per year, lime and manure increasing the losses. The phosphate loss from the check tanks was small, amounting to but 4 parts per million of the phosphate ion, with a decrease in loss on treatment with lime and manure.

Replaceable bases in some Oregon soils, R. E. STEPHENSON (*Soil Sci.*, 24 (1927), No. 1, pp. 57-64).—This article records data from the Oregon Experiment Station on the replaceable bases in certain of the basaltic soils of the Pacific Northwest, and specifically the following Oregon soil types: Waldo silt loam, Willamette silty clay loam, Dayton silty clay loam, Carlton silt loam, Antelope clay adobe, swampy Union loam, Klamath sandy loam, Deschutes sandy loam, Madiera sandy loam, and Hermiston sandy loam. For these soils, the replaceable bases, as defined and determined by Kelley and Brown (*E. S. R.*, 52, p. 318; 56, p. 115), are given in tables showing the replaceable calcium, magnesium, potassium, and sodium, together with the pH values of the samples. A discussion of these results specifically, and a more general discussion follow the presentation of the data. The conclusions reached are in part as follows:

Acid soils are likely to be low in replaceable calcium, because of the exchange of hydrogen for the former element and its removal by leaching. The heavier soil types appeared to have a greater base exchange capacity, but not necessarily a larger total amount of replaceable bases. Neutral soils tended to run high in replaceable calcium, this element being dominant both in amount and in function in good soils. Soil alkalinity results from replacement of calcium by sodium, with the result that alkali soils are high in exchangeable sodium. Both acidity and alkalinity of soils can be retarded, if not practically prevented, by suitable soil management.

The measurement of "suction forces" in colloidal soils, F. HARDY (*Soil Sci.*, 24 (1927), No. 1, pp. 71-75).—Criticizing the method for the measurement of soil suction force devised by Joffe and McLean (*E. S. R.*, 54, p. 417), on the ground that it takes no account of variations in the water conductivity of soils, the author presents experimental data based on measurements of the water-supplying powers of three different types of soils of approximately similar colloid contents, with the purpose of demonstrating that water conductivity may exercise the controlling influence over the water distribution in soils surrounding the Joffe and McLean instrument, and may therefore influence the measurements made. The method for evaluating suction forces described by Green and Ampt (*E. S. R.*, 25, p. 620) is discussed on the basis of a study of its application to the three soils studied in the preparation of this paper. This method is not considered sufficiently precise as a practical method, though the author believes it to be less open to criticism on the theoretical grounds mentioned than the method of Joffe and McLean.

Soil phosphorus studies, I-III (*Soil Sci.*, 24 (1927), No. 2, pp. 109-146).—The subject matter of these three papers may be represented in part as follows:

I, *The colorimetric determination of organic and inorganic phosphorus in soil extracts and the soil solution*, F. W. Parker and J. F. Fudge (pp. 109-117).—The methods of Denigès (*E. S. R.*, 44, p. 611) and of Fiske and Subbarow (*E. S. R.*, 55, p. 310) are described, with slight modifications, and discussed on the basis of experiments carried out at the Alabama Experiment Station to ascertain their relative sensitiveness and the possible interfering effect of silica. It is concluded that the method of Denigès is the more sensitive, and is therefore to be recommended for most work with soil solutions and

soil extracts. It is considered that the Fiske and Subbarow method may be useful in plant analyses and for the determination of phosphorus soluble in dilute acids.

II, *The concentration of organic and inorganic phosphorus in the soil solution and soil extracts and the availability of the organic phosphorus to plants*, W. H. Plerre and F. W. Parker (pp. 119-128).—The organic and inorganic phosphate contents of the displaced solution and of 1:5 water extracts of 21 soils collected from 9 States were determined, using the procedure of Parker and Fudge, above noted. Absorption and growth studies were then made to determine the availability to plants of the water-soluble organic phosphorus. In the displaced solution from 20 out of the 21 soils the average inorganic phosphate content was 0.09 part per million, the average organic phosphate content being 0.47 part per million. The 1:5 soil extracts of the same soils gave an average concentration of 0.35 part per million of inorganic phosphate and 0.22 part per million of organic phosphate. Absorption experiments indicated that plants would not absorb organic phosphate from soil extracts or from the displaced solution, the plants absorbing in the same experiment all of the inorganic phosphate present. In other experiments corn made no growth when organic phosphate in soil extracts was the only source of phosphorus, but grew well in soil extracts containing inorganic phosphate. The growth in the various extracts was almost proportional to the inorganic phosphate present. The bearing of these results on plant nutrition problems is briefly discussed.

III, *Plant growth and the absorption of phosphorus from culture solutions of different phosphate concentrations*, F. W. Parker (pp. 129-146).—Report is made of four experiments constituting a study of the concentration of phosphate necessary for the maximum growth of corn and soy beans. A detailed description of experimental procedure is given, special attention being devoted to the method of renewing the phosphate concentration and maintaining it as nearly constant as possible. The rate of absorption of phosphate from solutions of various concentrations was studied, and the bearing of the data presented on plant nutrition theories is discussed. The results of the investigation may be summarized in part as follows:

To provide favorable conditions for plant growth in culture solutions of low phosphate concentrations, large volumes of solution for each plant are necessary, together with the frequent renewal of the phosphate concentration and the growth of the plants in an iron-free culture solution. Iron must be supplied occasionally for a period of one or two days. Maximum corn growth was secured with a 0.50 part per million phosphate concentration. Growth at 0.25 part per million was good, the dry weight being about 75 per cent of the maximum. It is considered that the maximum growth of corn under field conditions could probably be obtained with 0.15 to 0.20 part per million of phosphate if the phosphate concentration could be maintained constant, and that fair to good growth might be secured at a concentration of 0.10 part per million. Maximum soy bean growth was also secured at the 0.50 part per million concentration. From the fact that the displaced solutions of many productive soils contained but a trace of inorganic phosphorus, the conclusion is considered necessary that plants do not obtain all of their phosphorus from the solution represented by that obtained by the displacement method, and that apparently solid soil matter has an important function in the phosphorus nutrition of plants. It is suggested that at present there is no definite proof that a Donnan equilibrium exists in soils, and that, granting that it does exist, the concentration of the solution at the surface of the soil particles remains undetermined. A number of other inferences are drawn from the data presented.

[Soil bacteriology papers from the New York State Experiment Station] (*New York State Sta. Tech. Bul.* 129 (1927), pp. 27).—This bulletin consists of two papers as follows:

The general soil flora, H. J. Conn (pp. 3-10).—This is a general discussion of the methods which have been applied to the investigation of soil flora, their failure in the past to yield much significant result being pointed out. Much emphasis is laid on the promise of direct microscopic methods recently employed by Winogradsky (*E. S. R.*, 54, p. 119). The methods used by the author of the present paper are also discussed. Important unsolved problems in soil bacteriology are summarized, and the possible application to their solution of some new methods is noted.

The bacterial flora of four soils compared by the direct microscopic method, L. M. Thatcher and H. J. Conn (pp. 11-27).—Using Winogradsky's modification of the microscopic technique originally proposed by one of the authors, four soils, Dunkirk silty clay loam, Dunkirk fine sand, Volusia silt loam, and Hoosick coarse sandy loam were studied, the effect of the addition to these soils of peptone, starch, mannite, and soy bean meal, with and without liming, being investigated. The principal differences observed correlated with the reaction of the soils, the two acid soils, those of the Volusia and Hoosick series, responding quite differently from the other two soils in the absence of lime, while the difference was considerably diminished, though not wholly overcome, by the addition of calcium carbonate. It is suggested that, while no striking conclusions concerning the soils studied were brought out by this investigation, the method is potentially valuable and should be applied to the study of other soils.

The effect of protozoa and fungi on certain biochemical processes when inoculated into partially sterilized soil, C. E. SKINNER (*Soil Sci.*, 24 (1927), No. 3, pp. 149-161).—Calling attention to the long recognized effect of heat treatment and of partial sterilization by volatile antiseptics in increasing the yield of the following crop, this contribution from the New Jersey Experiment Stations presents, in a concise review of the literature, the main points of the bacteriological observations and theory brought out by the work of Russell and Hutchinson (*E. S. R.*, 20, p. 122) and others with respect to partial sterilization phenomena. It makes clear that "the question whether protozoa markedly influence biochemical transformations in the soil is still an open one," and that in all the previous work only the bacteria and protozoa have been considered, the fungi, algae, and actinomycetes having been almost entirely ignored. Accurate reinoculation, involving one species of protozoa (a definite number of one species of bacteria being added to sterilized or partially sterilized soil), as contrasted with the same experiments minus the protozoa, together with some work involving fungi and actinomycetes, is therefore considered an important need.

In the present experiments, 200-gm. samples of moist soil from a plat fertilized for 69 years with complete minerals and ammonium sulfate were partially sterilized by heating slowly to 80° C. in 300-cc. Erlenmeyer flasks in a water bath, the temperature being held at 80 to 85° for 1 hour. These samples were then reinoculated in various ways with pure cultures of *Hartmanella Hyalina*, the inocula consisting of 12,400 cysts of this protozoon growing in a culture with 9,000,000 bacterial vegetative cells of a small spore-forming rod. The bacterial inoculum consisted of 9,000,000 vegetative cells of the same bacterium without the protozoa. The inocula of fungi consisted of suspensions in sterile soil infusion of spores of *Trichoderma kőnigti* and of a green *Penicillium* of the *glaucum* type. Tabulated data show the effects of these inocula upon ammonia nitrogen,

nitrate nitrogen, total available nitrogen, and on carbon dioxide production for periods up to 115 days. Counts of the bacteria and of the fungi are also given.

It is concluded that the depressing effects of the protozoa upon carbon dioxide production, bacterial numbers, and nitrate accumulation are, though small, undoubtedly larger than can be attributed reasonably to experimental error. The protozoan theory of Russell and Hutchinson, above cited, is therefore considered as being to some extent supported by the experiments here described. The author, however, believes protozoan activity to be only one of a number of factors operating to produce the phenomenon of partial soil sterilization, and presents, in a rather full discussion, the possible effect of other elements of the soil population. It is noted, *inter alia*, that the effect of the fungi in the present experiment was "as large as, or larger than, that of the protozoa studied."

Nitrate assimilation by soil microorganisms in relation to available energy supply, F. E. ALLISON (*Soil Sci.*, 24 (1927), No. 2, pp. 79-93, pl. 1).—This joint contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory and the New Jersey Experiment Stations is a study of the competition of higher plants with soil bacteria for the available nitrate supply of the soil solution as affected by fresh supplies of organic matter. A number of sources of organic matter were examined in preliminary experiments, but the main series of experiments were limited to studies of the effects and behavior of additions of fresh manure, the subjects of the various series of experiments being the effect of various sources of organic matter on the growth of oats, the effect of fresh manure on soil nitrates, the ammonification of fresh manure in soil, the rate of nitrification of fresh manure in soil, the recovery of nitrates from soils fertilized with sodium nitrate and fresh manure, nitrification of ammonium sulfate in the presence of fresh manure, the effect of fresh manure on the growth of buckwheat fertilized with an excessive amount of sodium nitrate, and the effect of fresh manure on the growth of wheat in the greenhouse. A brief discussion follows the presentation of the data obtained, and the following conclusions are drawn:

The addition to soils of readily decomposable materials of a high carbon-nitrogen ratio markedly increases biological activities and decreases the soil nitrate concentration on account of the nitrate assimilation by the soil bacteria, with a resulting injury to most crops due almost wholly to nitrate starvation. Under these conditions nitrate additions bring about growth as good as, or even better than, on untreated soils. The crop injuries caused by fresh stable manure are not due to a toxic compound or to the added microorganisms, but to the bacterial nitrate assimilation noted above. There is no appreciable difference in the nature of the injury produced by such materials as fresh stable manure, timothy hay, straw, and corn stover. Differences noted are of degree only and are due to varying carbon-nitrogen ratios. The injury is not permanent, continuing only until the material for excessive biological activities has been used up and time sufficient for the protein of the dead bacterial cells to be made available for plants through ammonification and nitrification has elapsed. The period of depression noted in these experiments was from four to eight weeks, but would vary widely under field conditions.

The influence of manures and organic residues on plant growth, G. A. NEWTON and K. B. DANILOFF (*Soil Sci.*, 24 (1927), No. 2, pp. 95-101, pl. 1).—Noting the frequency with which reduced yields have followed the return of straw to the land for the maintenance of organic matter and the vital importance of practical means for the maintenance of organic matter in grain

farming, especially in the drier regions where summer fallowing is the common practice, this communication, originally submitted as a master's thesis at the Washington State College, reports experiments with sawdust, pine needles, and straw, and the effect of additions of nitrogenous fertilizers upon the tendency of these low nitrogen organic substances to depress crop yields, together with the results of the application alone or supplemented with sodium nitrate of fresh and of rotted manure. Pot cultures were used.

Contrary to the more or less prevalent popular impression that pine needles when used as a source of organic matter are toxic to plants, the depressing effect of straw was found most pronounced, though the pine needles and the sawdust also depressed the yields considerably below those of the controls. In the second group of experiments, in which fresh and rotted manure were used, similar though less marked depressions of the yield were noted. In all cases the addition of sodium nitrate showed a marked corrective effect. The use of 2 tons per acre of pine needles or of sawdust gave, on the addition of 150 lbs. per acre of nitrate of soda, larger yields than did the controls, though with 2 tons of straw 150 lbs. of nitrate of soda was still insufficient entirely to counteract the depressing influence. Contrasts in the case of the manure treatments were less marked, apparently because of the lower carbon-nitrogen ratio of the added organic matter.

Fertilisers and soil improvers: Description, application, and comparative value. W. GARDNER (*London: Crosby Lockwood & Son, 1927, pp. VII+184*).—This is a condensed handbook for the farmer and gardener. In chapter 1 are very compactly presented the main features of the modern concept of the soil in its physical, chemical, and biological aspects; the physical and chemical constituents of the soil; the elements of the (English) mechanical soil analysis system; and the significance of the analytical results. Chapter 2 gives a similarly compressed account of the general subject of fertilizers. The remaining 10 chapters deal briefly with the specific fertilizer types, individual substances and mixtures, and with lime, describing the manufacture of these products and their properties, and, in chapters 11 and 12, discussing their application and valuation. A rather comprehensive subject index is provided, and references are given in the text for a number of the more important points brought out.

The relative aluminum tolerance of crop plants, F. T. McLEAN and B. E. GILBERT (*Soil Sci.*, 24 (1927), No. 3, pp. 163-175, pl. 1).—Noting that, although the toxicity of aluminum and its activity in acid soils have been clearly demonstrated by Blair and Prince (*E. S. R.*, 49, p. 813) and others, and the comparative resistance of plants to aluminum poisoning predicted from field experiments of Burgess and Pember (*E. S. R.*, 50, p. 16), but few tests have been made with aluminum solutions of definite concentration, this paper from the Rhode Island Experiment Station presents a discussion of results of experiments with solution cultures of various crop plants, in which the plants were placed for one-half of each week in a complete nutrient solution and for the other half of the week were kept in nutrient solutions lacking only the phosphates and to which the desired amounts of aluminum in the form of the sulfate, tartrate, or citrate had been added. The course of these experiments was followed by means of observations of the weights of plant substance produced as roots, tops, and in the whole plant, analyses of the plant substance for phosphoric acid and the oxides of aluminum and iron, the effect of the growth of the plants upon the acidity of the aluminum-containing solutions, the local accumulation of aluminum in plant tissues as indicated by hematoxylin staining tests of Hoffer and Carr (*E. S. R.*, 49, p. 327), etc.

It was found that all the crops studied were injured by sufficiently high concentrations of aluminum if the acidity of the culture solution was such that the aluminum was not precipitated. Wide variations in sensitiveness to aluminum were noted, and it was possible to group the crops tentatively into the three classes of sensitive crops, the yield of which was depressed by as little as 2 parts per million of added aluminum, namely, lettuce, beets, timothy, and barley; crops of medium sensitiveness, the yield of which were depressed by 7 or less parts per million of added aluminum, these plants being radishes, sorghum, cabbage, oats, and rye; and resistant crop plants, the yields of which were not depressed by less than 14 parts per million of added aluminum, including corn, turnips, and redtop. The tendency of some of the plants to change the solutions toward a more alkaline or a more acid reaction was not correlated with the sensitiveness of the crop toward aluminum, plants of each of the three grades of sensitiveness being found both in the alkalifying and in the acidifying groups. Dwarfing and root injury were the first evidence noted in aluminum intoxication. The aluminum poisoning of corn plants was accompanied by reduced absorption of dyes, of nitrate, and of water. As indicated by the hematoxylin test, the absorbed aluminum accumulated in the cortex, mainly in the protoplasm, and was concentrated in the nuclei. Aluminum accumulation was not detected in these tests in any other parts of the young plants except the cortex of the immersed roots.

The delayed effect of liming, P. E. KARBAKER (*Soil Sci.*, 24 (1927), No. 2, pp. 147, 148).—In connection with the experiments on alfalfa root nodule formation, previously noted (E. S. R., 57, p. 826), in addition to the acid field soil and limed field soil pots some observations were made on pots of acid Berea and Mayfield soils limed with 5 gm. of 40-mesh limestone for each 2,000 gm. of soil. During the eight weeks of the experiment the Berea soil, limed immediately previous to the experiment, gave practically no better growth of alfalfa than did the unlimed soil, and the limed Mayfield soil gave no better results than did the untreated soil for the first four weeks of the experiment. The alfalfa growth was removed on July 1 and the pots were left in an air-dry condition until December 12, when, without further treatment, they were again planted to alfalfa. This second growth of alfalfa was as good on the acid soils limed just before potting as on the same soils limed in the field. It is concluded that intervals up to 2 months between liming and seeding of acid-sensitive legumes may be necessary for the securing of the full benefit of the liming treatment.

AGRICULTURAL BOTANY

Factors influencing the pH equilibrium known as the isoelectric point of plant tissue, W. J. YOUDEN and F. E. DENNY (*Amer. Jour. Bot.*, 13 (1926), No. 10, pp. 743-753, figs. 3).—In making use of the method of determining isoelectric points for plant tissue which consists in placing pieces of the tissue in a series of buffer solutions of varying H-ion concentrations and noting the pH value of the buffer at which no change in reaction occurs, it was found that this equilibrium pH in case of a number of plants was the pH of a water extract of the tissue in contact with water instead of buffer solution for the same time under the same conditions.

Most of the effect upon the buffer solution was not due to absorption of ions from the buffer by the tissue, but was caused by substances leaching out of the tissue into the buffer. The soluble substances which leached out of the tissue and which exerted a dominant effect in changing the reaction of buffers

in contact with the tissue dialyzed readily through collodion, were not coagulated by heat, and were soluble in acid alcohol. This shows that proteins or other colloidal substances do not play an important rôle in causing the change in pH.

"Since the tissue itself is not mainly involved, and since the effect produced is not due to proteins or other amphoteric colloids, it is thought that this method does not give reliable information as to the pH value of the isoelectric point of a tissue or furnish satisfactory evidence of the existence of such a point."

A study of suction force by the simplified method.—I, Effect of external factors. II, Periodic variations and the influence of habitat, F. J. MOLZ (*Amer. Jour. Bot.*, 13 (1926), Nos. 7, pp. 433-463, fig. 1; 8, pp. 465-501, figs. 2).—Following a résumé of recent studies on suction force and turgor pressure is an account of the author's studies, limited to work with suction force by means of a newly devised, simplified method, which does not permit the measurement of individual cells but instead that of strips of tissue.

External factors especially influencing suction force are soil moisture and atmospheric humidity. A heavy rain after a drought may lower suction force in leaves by more than 20 atmospheres. Temperature plays an important rôle with land plants in winter.

The suction force in land plants shows clearly periodic variations. The character of the diurnal suction-force curve, which shows a maximum toward noon, is ascribed principally to variations in atmospheric moisture. The annual curve depends primarily upon precipitation, and in winter also upon low temperatures. A discernible effect upon suction force is produced by various habitats, the lowest values (though not as low as might be expected) being found in submersed aquatic plants, with rise in value according to increasing dryness. Different species may show quite different suction-force values, which depend partly upon the habitat and partly upon the characteristics of a given species.

The effect of transpiration and environmental factors on leaf temperatures, I, II, H. H. CLUM (*Amer. Jour. Bot.*, 13 (1926), Nos. 3, pp. 194-216, figs. 5; 4, pp. 217-230, figs. 5).—Two papers are given.

I. Transpiration.—Determination of the temperatures of leaves of *Fuchsia speciosa*, *Phaseolus vulgaris*, *Brassica oleracea*, and *Syringa vulgaris* by means of thermocouples under various environmental conditions, mainly in bright sunlight, showed these leaves to be nearly always warmer than the air during the day, in direct sunlight frequently 5 to 10° C. warmer. The maximum difference between leaf and air temperatures recorded in the open was 13.1°, and in the greenhouse 16°.

Transpiration rates measured while the temperature determinations were being made showed that transpiration was checked in certain plants by allowing the soil to become dry, and in some leaves by vaselining the surface, the plants in dry soil and the vaselined leaves being 2 to 4° warmer than the controls. A like difference in temperature was observed between fresh green and pressed dried leaves, but no definite correlation was found between the transpiration rate and the difference between the leaf and air temperatures, nor between the difference of the transpiration rates of two leaves or plants and the difference of their temperatures.

II. Light intensity and the relation of transpiration to the thermal death point.—Wide and rapid fluctuations of leaf temperature were noticed in *Fuchsia speciosa*, *Brassica oleracea*, *Syringa vulgaris*, *Lactuca sativa*, and *Ligustrum ovalifolium*, the effect being especially marked when the leaves were suddenly shaded and exposed to the sun. A change of 5 to 7° C. in less than a

minute was common, and fresh green leaves varied as much as those pressed and dried. The maximum fluctuation was observed in the greenhouse, where a fresh lettuce leaf showed a rise of 13.4° in 35 seconds. The angle of incidence of the sun's rays was a factor.

In an attempt to determine the thermal death point of plants in an inclosed glass chamber in sunlight, leaves of fuchsia and of lilac were injured at about 50°, privet leaves appearing more resistant. Since cooling due to transpiration is very small compared with the effects upon leaf temperature of such factors as light intensity, angle of incidence, convection, radiation, and air currents; since the sun did not heat even a dried leaf to an injurious temperature in the open; and since, under severe conditions, lowering the temperature by 2 or 3° would not greatly prolong the life of a plant if the temperature remained constant, it is thought that in a climate such as that of Ithaca, N. Y., the cooling effect of transpiration is insignificant and inadequate to protect the leaves of the plants studied from burning in bright sunlight.

Evaporation in vegetation at different heights, F. C. GATES (*Amer. Jour. Bot.*, 13 (1926), No. 3, pp. 167-178).—Studies carried on in the Douglas Lake region in Cheboygan County, Mich., have permitted a comparison of the evaporation rates in the crowns of different plants at different levels above the ground. Increase was shown even in case of very slight differences in elevation. The increase is rapid at first, but decreases with height. The greatest increase rates appear in the bog series. The actual evaporation rate is dependent upon local conditions. A plant meets conditions of increasing severity as it grows upward.

A physiological study of the effect of light of various ranges of wave length on the growth of plants, H. W. POPP (*Amer. Jour. Bot.*, 13 (1926), No. 10, pp. 706-736, pls. 2, figs. 8).—In an investigation to determine the effect on plants of removing definite regions of the spectrum in the blue-violet end, several widely different varieties of plants were grown in five separate greenhouses so constructed that practically all conditions except the quality of light could be kept alike in all houses. General observations were made on vegetative vigor, flowering, and fruiting. The height was measured weekly, chemical analyses and microchemical tests were made, and anatomical changes were followed in some cases. The results obtained are detailed for the different wave lengths.

The results as a whole indicate that, while ultra-violet rays are not indispensable, the blue-violet end of the spectrum is necessary for normal, vigorous growth of plants.

The favorable effect of reduced oxygen supply upon the germination of certain seeds, T. MORINAGA (*Amer. Jour. Bot.*, 13 (1926), No. 2, pp. 159-166, figs. 3).—It is stated that seeds of cat-tail (*Typha latifolia*), which germinate poorly if at all in air, germinate promptly when the air is diluted with hydrogen or nitrogen. Favorable concentrations, giving about 96 per cent germination, were obtained with from 40 to 80 per cent by volume of hydrogen or nitrogen. The addition of 20 per cent of oxygen to the air resulted in only 1.3 per cent germination, while the addition of 60 per cent of nitrogen gave 97 to 98 per cent. Germination attained 94 per cent in a 99 per cent hydrogen admixture, but no chlorophyll developed. A very low oxygen content in flasks, liquids, and seeds resulted in no germination. When the seed coats are broken the favoring effects of reduced oxygen pressures disappear.

Bermuda grass (*Cynodon dactylon*) also germinates somewhat better when the oxygen is reduced by diluting air with hydrogen or nitrogen, favorable mixtures including from 40 to 60 per cent of hydrogen or nitrogen.

Can a pyrrole derivative be substituted for iron in the growth of plants?

C. G. DEUBER (*Amer. Jour. Bot.*, 13 (1926), No. 5, pp. 276-285, figs. 2).—When corn, cowpea, soy bean, and *Spirodela* plants were grown in nutrient solutions containing a magnesium salt of pyrrole carbonic acid, in substitution for iron, leaf chlorosis was not prevented in any case. Microorganisms develop luxuriantly in such a nutrient solution. In water cultures the pyrrole salt at concentrations of 0.001 to 0.250 gm. per liter was toxic to the plants used. It was toxic to cowpea plants when applied to the leaves as a paint, and under sterile conditions toxic to corn plants.

The basis of a physiological conception of symbiosis [trans. title], V. VOUG (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 2 (1926), No. 4-5, pp. 661-668, fig. 1).—As a consequence of facts set forth, symbiosis is defined to be the (cellular) living-together of two unlike organisms in a physiological equilibrium. The physiological significance of symbiosis lies in the reciprocal relations of the symbionts in regard to nitrogen and carbon assimilation. The author distinguishes the two separate types of symbiosis, that of fungal symbiosis (mycosymbiosis), in which the endosymbiont assumes or performs the function of nitrogen assimilation, and that of algal symbiosis (phycosymbiosis), in which the endosymbiont assumes or performs the function of carbon dioxide assimilation.

Further studies on the methods of Gram staining, G. J. HUCKER and H. J. CONN (*New York State Sta. Tech. Bul.* 128 (1927), pp. 34).—This publication supersedes a previous bulletin of the station on the same subject (E. S. R., 49, p. 731). A summary of the previous publication and the results of later investigations directed by the second author are given.

The later work is said to verify the conclusion of the earlier bulletin that results with any particular organism may vary considerably, according to the technique used. It is claimed that with any method adopted care must be used in the manipulation of Gram-positive organisms may be called negative, or vice versa. The authors state that no worker should pronounce any particular organism either positive or negative after a single investigation.

In conclusion it is urged that all authors publishing results depending in whole or in part on the Gram stain describe their staining method in considerable detail.

GENETICS

The chromosomes of three Delphinium-species, K. TJEBBES (*Hereditas*, 10 (1927), No. 1-2, pp. 160-164, figs. 18).—Counts at the Beet Research Station at Landskrona, Sweden, made in pollen mother cell reduction divisions, showed that in *D. ajacis*, *D. consolida*, and *D. nudicaule* the haploid chromosome number $N=8$. Only slight differences were observed between the three species in size and shape of chromosome. In all three species two of the chromosome pairs are much larger than the other six.

The comparison of chromosomes among different species in Triticum, F. KAGAWA (*Imp. Acad. [Japan], Proc.*, 3 (1927), No. 5, pp. 304-306).—The somatic chromosomes of *T. monococcum*, *T. dicoccum*, *T. polonicum*, and *T. vulgare* are compared as to their lengths and to the number and position of constrictions.

Interspecific hybridization in Nicotiana.—VI, Cytological features of *syvestris-tabacum* hybrids, T. H. GOODSPEED and R. E. CLAUSEN (*Calif. Univ. Pubs. Bot.*, 11 (1927), No. 7, pp. 127-140, figs. 9).—The sixth number of this series (E. S. R., 56, p. 632) describes the chromosome behavior and the results of the distributional mechanism operative at meiosis of the F_1 *N. sylvestris* ×

N. tabacum hybrid, as indicated in part by the chromosome complements of the backcross progeny with *N. sylvestris*.

The convergent improvement of selfed lines of corn, F. D. RICHEY (*Amer. Nat.*, 61 (1927), No. 676, pp. 430-449, fig. 1).—The principle of convergent improvement is suggested as meeting the need of a method for improving the productivity of selfed lines of corn without interfering with their behavior in hybrid combination. Application of this principle to selfed lines of corn may provide information on the cause of heterosis.

Convergent improvement involves the reciprocal addition to each of two homozygous selfed lines, which combine to produce a high yielding cross, of those dominant favorable factors which one line lacks and the other carries. The method consists in crossing the two lines, back pollinating to one line through each of several generations to recover the genotype of the recurrent parent, at the same time practicing selection to retain favorable factors entering the cross from the other parent, selecting within selfed lines to fix the added factors in the homozygous condition, performing these operations in parallel with each of the original lines as the recurrent parent, and repeating the operation to achieve further improvement, using the recovered lines in place of the original parent lines as foundation stocks.

Further studies on the inheritance of resistance to crown rust (*Puccinia coronata* Corda.) in F_2 segregates of a cross between Red Rustproof (*Avena sterilis*) and Scotch Potato oats (*A. sativa*), D. W. DAVIES and E. T. JONES (*Welsh Jour. Agr.*, 3 (1927), pp. 232-235).—In a paper previously noted (*E. S. R.*, 55, p. 525), detailing the mode of inheritance of resistance and of susceptibility to oat crown rust, the segregation in the F_2 generation indicated that the inheritance of these characters is dependent on a single factor difference. Resistance appears to behave as a simple dominant, and accordingly F_2 segregates classified as resistant should in the F_3 generation give pure breeding resistant and segregating families in a ratio of 1:2. To verify this conclusion 35 of the F_2 seedlings were grown to maturity in 1925, and seed was obtained for further inoculation studies in the F_3 . The results of studies on these plants are given in this paper.

From mature F_2 segregates 35 plants were selected at random to furnish seed for the next year, and of these 29 had been classified in the seedling stage as resistant, 6 as susceptible. The 83 seedlings in the 6 cultures made from these susceptible plants were all completely susceptible, the data supporting the conclusion that the character susceptibility to crown rust in this particular cross behaves in inheritance as a simple recessive. Further confirmation is indicated with discussion, including linkage possibilities.

"Percentage of blood" and Mendelism, J. L. LUSH (*Jour. Heredity*, 18 (1927), No. 8, pp. 351-367, figs. 6).—A theoretical discussion is given of the merits of describing individual animals by the percentage of blood, using as the basis the possibility of measuring and differentiating between $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, etc., Brahman bulls, which are used for breeding purposes in the Gulf States.

The theoretical distribution with the standard deviation was calculated for the different Brahman crosses on the assumptions that there were 19 and 38 factor differences between the Brahman and native cattle, and further assuming that segregation was independent and dominance was lacking. The accuracy of the percentage of blood descriptions, considering the whole animal as the unit, was shown to increase as the number of independent factors increased. The percentage of blood descriptions were concluded to be sufficiently accurate to differentiate $\frac{3}{4}$ -blood from $\frac{1}{4}$ -blood Brahmans with 19 factors, but not accurate enough to separate animals differing by only $\frac{1}{16}$ blood. If 38 inde-

pendent factors were involved, individuals differing by $\frac{1}{8}$ blood could be determined with the probability of accuracy in 29 out of 30 cases, but in only 8 cases out of 9 could accuracy be expected in differentiating between $\frac{3}{4}$ Brahman and $\frac{1}{4}$ Brahman.

The number of chromosome pairs, probably not over 19, limits the number of independent factors, and linkage reduces the degree of differentiation possible, though crossing over has the opposite effect. Thus the chromosome length has an important bearing on the degree of differentiation in the percentage of blood which it is possible to expect.

It is concluded that measuring the relationship between two individuals by the percentage of blood does not lead to serious error when one of the two individuals is a direct ancestor of the other, but that this method is not suitable when the two individuals are collateral relatives, nor is it applicable for measuring the degree of inbreeding.

Genetics and the production of show type animals, H. L. IBSEN (*Jour. Heredity*, 18 (1927), No. 6, pp. 241-243, pl. 1, fig. 1).—A brief account is given of studies at the Kansas Experiment Station dealing with the inheritance of characters desirable in guinea pigs used for show purposes and also in the production of sythetic pink-eyed show whites, which are superior to the usual albino animal in the show ring since the latter has more or less dark color in the ears and feet. The sythetic whites are pink-eyed (*p*), lack red (*Cr*) and black (*B*), and the chocolate is diluted by the pink-eyed factor and limited to the ears and feet by the nonextension factor (*e*). A recessive factor causing individuals which were yellow at first to fade gradually into cream was also discovered in show type creams. There has been some indication that the desired droop of the ears is due to a recessive factor.

Inheritance of butterfat percentage in Jersey cows, L. COPELAND (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 344-352).—From a study of certain groups of milk and fat records in the Register of Merit of Jersey cattle, the author found the coefficient of variability for milk records to be 19.72; for fat percentage 10.16; and for total fat 10.45 per cent, thus indicating that the variation in the butterfat is less than in the milk yield.

The records of the daughters of certain sires and the daughters of tested dams indicated that both parents contribute to the inheritance of fat percentage. A single parent may be prepotent in increasing the fat percentage of daughters without affecting milk yield, or both fat percentage and milk yield may be affected.

An analysis of the 1926 records showed that though there was a negative correlation between milk yield and fat percentage of -0.311 ± 0.0310 , there was a positive correlation of 0.233 ± 0.0324 between fat production and fat percentage. Thus improvement in total butterfat production may be accomplished by the selection for high fat percentage as well as for large milk yields.

Sex and horns in cattle, O. O. CHURCHILL (*Jour. Heredity*, 18 (1927), No. 6, pp. 279, 280).—The inheritance of the polled and horned conditions in a herd of cattle which appears to be sex-linked is described.

A horned bull sired by a polled bull from a horned dam was first used in the herd. All of the resulting heifers were polled and the bulls horned. In later matings of the F_1 , F_2 , and F_3 heifers, which were all polled, with horned bulls having horned parents, the male offspring were horned and the females were polled.

Night blindness in cattle, W. A. CRAFT (*Jour. Heredity*, 18 (1927), No. 5, pp. 215, 216).—Three calves which were related and which were evidently blind at night are described, from an Oklahoma herd. It was suggested that the

blindness was due to an hereditary defect involving the arrangement of the rods and cones of the retina.

Five generations of hemophilia, L. LUKOWSKI (*Jour. Heredity*, 18 (1927), No. 5, pp. 213, 214).—An account is given of the inheritance of hemophilia through five generations of a Polish family. There were 8 hemophilic males but no hemophilic females, though the tendency was always transmitted through the mother.

The grades of related students, R. R. HUESTIS and T. P. OTTO (*Jour. Heredity*, 18 (1927), No. 5, pp. 225, 226).—The correlation coefficients between the sophomore grades of sibs in classes at the University of Oregon were 0.61 ± 0.07 for sisters with sisters; 0.74 ± 0.06 for brothers with brothers; and 0.04 ± 0.11 for brothers with sisters.

The diagnosis of identity in twins, H. W. SIEMENS (*Jour. Heredity*, 18 (1927), No. 5, pp. 201-209, figs. 8).—The author points out groups of characteristics which may be used for the differentiation between monozygotic and dizygotic twins, indicating that an actual mistake in determining the identity of twins need never occur. Among the characteristics suggested for consideration are traits which almost always agree in monozygotic twins and rarely in dizygotic twins, i. e., hair color and form, eye color, skin color, and downy hair of the body; traits varying within narrow limits in single ovum twins and which show more distinct variation in double ovum twins, i. e., freckles, appearance of blood in the skin, follicular processes, and tongue and teeth; and traits in which monozygotic twins usually show strong resemblances to each other, while dizygotic twins rarely show resemblances, i. e., form of face, form of ear, form of hands, and body build.

Presence of the testicular hormone in the blood of normal cocks [trans. title], CARIDROIT and PÉZARD (*Compt. Rend. Soc. Biol. [Paris]*, 95 (1926), No. 23, pp. 296-298; abs. in *Internat. Rev. Agr. [Rome]*, n. ser., 18 (1927), No. 4, p. 459 (227T)).—The authors have found that castration after maturity gives rise to a regression of the comb. A fragment of the comb of an adult cock grafted on to its back was found to retain its turgescence.

From these results it is concluded that the blood contains the testicular hormone.

Selective fertilization in fowls, L. C. DUNN (*Poultry Sci.*, 6 (1927), No. 5, pp. 201-214).—An account is given of tests of possible selective fertilization of eggs with sperms from different males conducted at the Connecticut Storrs Experiment Station. In carrying out these tests Wyandotte and Leghorn hens were mated as nearly simultaneously as possible with males of the same breed and with a rose-combed Hamburg or a pea-combed Pit Game male, thus allowing identification of the paternity of the chicks prior to hatching according to the characteristics of the comb.

The results indicated that of the fertile eggs 92 were fertilized by the nearly related male, while 15 were fertilized by the unrelated male. It is pointed out that the evidence is not sufficiently complete to draw final conclusions as to selective fertilization in favor of the germ cells of nearly related individuals, but that the evidence from different groups was all in that direction. The testing of the variation between individuals as to potential fertility and other factors not directly connected with relationship was difficult.

Other information brought out in these experiments indicated that the time elapsing between mating and the laying of the first fertilized egg averaged less than 48 hours, with a minimum of about 21 hours. The duration of fertility from a single mating averaged over two weeks, with a maximum of approximately one month. There was no indication of a differential viability of

embryos resulting from the age of the sperm up to at least two weeks nor any indication of an effect on the sex of the embryos.

Fertilization phenomena in the angiosperms [trans. title], K. V. O. DAHLGREN (*Hereditas*, 10 (1927), No. 1-2, pp. 169-229).—Prepared at the Botanical Institute of Uppsala, Sweden, this comprehensive review deals with the subject under the topics of pollen sac, male gamete, double fertilization (including a list of plants in which it is observed), genetics of the endosperm, non-appearance of double fertilization, other anomalies of fertilization, merogony, and development of the haploid egg cell. The literature cited embraces 312 titles.

Physiology of reproduction in horticultural plants.—II, The physiological basis of intermittent sterility, with special reference to the spider flower, A. E. MURNEEK (*Missouri Sta. Research Bul.* 106 (1927), pp. 37, pl. 1, figs. 11).—A further contribution (E. S. R., 56, p. 440) to the general subject, utilizing as plant material the spider flower, *Cleome spinosa*, a species normally manifesting cyclic sterility because of morphological changes in the structure of the stamens and pistils following fruit setting. The author succeeded by destroying the first fertile flowers in interchanging the spatial arrangement of the alternating sterile and fertile cycles, indicating that the developing fruits were apparently directly responsible for the initiation and maintenance of sterility. The nonfruiting sterile cycles were caused by a periodic abortion of the pistils rather than lack of pollen. Cultures with no external supply of nitrogen behaved normally in respect to periodicity except in showing a slight increase in the total number of male flowers. No marked effect of reproduction upon vegetative growth was noted except in the low nitrogen plants where the lack of nitrogen apparently acted as a limiting factor.

In the case of high nitrogen plants continued depistillation in many instances resulted in the continuous production of perfect flowers, a continuity which was broken only when fruits were allowed to form. The rather narrow localization of the influence of reproduction was shown in the case of a two-stemmed plant, one branch of which by daily removal of the pistil was induced to form perfect flowers continuously, while the untreated branch behaved normally.

In analyzing the results the author concludes that, in general, sexual reproduction or gametic union may be considered the primary cause of the peculiar responses observed, creating localized metabolic gradients to the detriment of other metabolically weaker parts of the plant. The results are used in interpreting particular types of sterility occurring in economic horticultural plants.

A simple measure of fecundity, R. M. HARPER (*Jour. Heredity*, 18 (1927), No. 5, pp. 217-223, figs. 2).—By expressing fecundity as the ratio of the number of minor children to adult women, as recorded in the census reports from 1850 to 1920, the author shows a general decline in fecundity in the various geographical divisions of the United States among both the white and negro populations. The similarity of the negro and the white decline and the relative standing for the different geographical groups are striking.

FIELD CROPS

Crop production in southwestern Kansas, E. H. COLES and F. A. WAGNER (*Kansas Sta. Bul.* 239 (1927), pp. 30, figs. 7).—Practices applicable to the production of crops without irrigation in southwestern Kansas are described from the experiences of farmers and the results of experiments since 1909 at the Garden City Substation in cooperation with the U. S. Department of Agriculture. Climatic and experimental data are tabulated and discussed. A rational farm-

ing system for the section provides for the production of sorghums, winter wheat, and livestock. Corn, spring wheat, oats, flax, and barley do not seem to be adapted except for a few localities and special purposes.

Summer fallow and also rye plowed under for green manure were followed by the best winter wheat yields, although the rye was deemed too expensive. Fallow plowed in the fall and again in June averaged 14 bu. per acre during 12 years, fall plowed 12.6, and early fall listed 12.5 bu. The last method was the cheapest and probably the most practical. The tests emphasized the need of plowing or listing in the fall or very early in the spring the ground to be fallowed. A fallow should evidently be cultivated whenever necessary to control weeds and keep the soil receptive to rain, but cultivation in excess of this is likely to be harmful rather than beneficial. Early fall listing has given the best yields of any method when wheat is grown continuously on the same land, and is cheaper and less favorable to soil blowing than early fall plowing. Wheat did better after sorghum in rows about 7 ft. apart than after sorghum in rows half that width. The optimum for seeding wheat is from September 20 to October 20 and from 2.5 to 3 pk. per acre.

Dwarf Yellow milo, closely followed by Dwarf White milo, outyielded other grain sorghums in yield, and of the sorgos Honey, Sumac, and Kansas Orange produced the most silage. While surface planting resulted in the highest kafir yields, the better methods of listing return similar yields and at less cost. The experiments showed that the most essential point in preparing the land and planting sorghums is to control the weeds and get the ground into condition for prompt germination and rapid plant growth. All methods which include early spring listing or disking have given good yields as compared with the common method of listing without previous preparation. Double disking in the spring about the time the weeds started to grow has averaged 6.2 bu. more than land treated similarly but without disking. Milo and kafir grown on summer fallow prepared as indicated for winter wheat have yielded considerably more than by other methods. For most sorghums the optimum planting period is from May 25 to June 7, although the earlier maturing sorts yielded satisfactorily when planted as late as June 15.

[Field crops work in Northumberland County, England], D. A. GILCHRIST (*Northumb. Co. Ed. Com. Bul.* 39 (1927), pp. 10-59).—The continuation of earlier investigations with field crops is reported on as heretofore (*E. S. R.*, 56, p. 334).

[Field crops experiments in Aberdeen, Scotland] (*North of Scot. Col. Agr., Guide Expts. [etc.] Cratbstone*, 1926, pp. 9-27, fig. 1; 1927, pp. 9-29, 33, 34, fig. 1).—Continued experiments (*E. S. R.*, 54, p. 434) conducted near Aberdeen with different cereal, forage, and root crops are reported for 1925 and 1926.

Colonial crops.—Textile plants, H. JUMELLE (*Les Cultures Coloniales.—Plantes Textiles. Paris: J.-B. Baillière & Sons*, 1927, 3. ed., vol. 6, pp. 121, figs. 33).—This is a further revision of the book noted earlier (*E. S. R.*, 34, p. 829).

[Agronomic and plant breeding work of the Landsberg, Prussia, Experiment Station], DENSCH, FRECKMANN, G. BREDEMANN, ET AL. (*Jahresber. Preuss. Landw. Vers. u. Forschungsanst. Landsberg a. d. Warthe*, 1926-27, pp. 16-49, 92-109).—Investigations reported for the year 1926-27 were similar in scope to those noted previously (*E. S. R.*, 57, p. 227).

Self-fertilization in relation to forage crop improvement, L. E. KIRK (*Sci. Agr.*, 8 (1927), No. 1, pp. 1-40, figs. 11).—Extensive self-fertilization studies with alfalfa, brome grass, and red clover at the University of Saskatchewan (*E. S. R.*, 57, p. 425) are reported on.

Comparisons of F_1 , F_2 , and F_3 generations of selfed lines from alfalfa (principally Grimm) with each other and with the open-pollinated parental material revealed, on the average, a pronounced and progressive reduction in vigor of growth for each generation of selfing, although a few of the F_2 and F_3 selfed lines did not differ significantly in yield from the corresponding open-pollinated strains from which they came. The mean seed yield for F_2 selfed lines of alfalfa generally showed a marked decrease compared with the corresponding open-pollinated strains. The correlation, $r=0.46\pm0.08$, obtained for the relationship of seed setting between F_1 and F_2 generation selfed lines, probably indicated that high and low seed production is inherited to a considerable extent. Differences in winter injury sustained suggested that self-fertilization apparently resulted in the segregation of factors conditioning the expression of the characters of resistance and susceptibility to winterkilling. Chlorophyll-deficient seedlings and other types of abnormalities occurred in inbred lines of alfalfa, the lack of chlorophyll seeming to be due to the interaction of two or more complementary recessive factors, the allelomorphs of which may be regarded as duplicate factors for chlorophyll development. Reduction in variability with respect to important morphologic and physiologic characters in selfed lines of alfalfa was a noticeable result of self-fertilization.

Selfed lines of brome grass were isolated which were more uniform than the commercial variety. Segregation with respect to extent of creeping habit of growth was very apparent, and the characters, high and low self-fertility, seemed to be inherited. A correlation, $r=0.55\pm0.11$, was obtained for the relationship of percentage of possible seed setting between selected plants and their progeny under controlled pollination. Selfed lines of brome grass yielded in almost direct proportion to the extent of spread of rhizomes. Most of such lines were less widely creeping than the average for plants of the commercial variety, and their yield was reduced accordingly. Spread of rhizomes is evidently strongly inherited, and the expression of this character exerts a dominating influence on yield when each plant has unrestricted space for development. Much of the reduction in yield of selfed lines evidently should be interpreted as a result of conscious selection of plant propagants rather than as a direct result of loss in vigor due to self-fertilization.

Artificial self-pollination resulted in seed production from 146 of 430 heads on as many red clover plants, the seed-yielding heads bearing from 1 to 48 seeds, averaging 8.83. The number of seed produced for all the self-pollinated heads averaged 7.26 per cent of that from open-pollinated heads. Chlorophyll deficient seedlings were found in 21 out of 81 self-fertilized lines. Most of the self-fertilized lines of red clover were markedly reduced in vigor and were considerably less variable than plants from cross-fertilized seed. Certain selfed lines of red clover continuously self-pollinated for four generations appeared to be more self-fertile on the average than a random sample of plants of the same variety, and some also seemed as vigorous as plants from normally cross-fertilized seed. According to the results, it appeared that some red clover plants are more self-fertile than others and that self-fertility in red clover is an inherited character.

Partial sterility in hybrids of sorghum and Johnson grass, H. N. VINALL (*Mem. Hort. Soc. New York*, 3 (1927), pp. 75-77, pl. 1).—As high as 96 per cent of sterility was observed in the F_1 from Dakota Amber sorgho \times Johnson grass, the cause of the sterility apparently residing more in a deficiency or poor quality of pollen than in imperfect pistils. Certain of the F_2 plants had rhizomes like Johnson grass and open, rather lax panicles, while others were heavier stemmed and practically devoid of rhizomes. Nearly all the plants had pithy stems like Johnson grass rather than the sweet, juicy stem of the sorgho.

The grasses of Ecuador, Peru, and Bolivia, A. S. HITCHCOCK (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium*, 24 (1927), pt. 8, pp. 291-556+XX).—An account is given of the grasses of the central Andes, embracing Ecuador, Peru, and Bolivia. The flora is mainly temperate and alpine, but becomes tropical on the coastal plain and on the eastern slope where the mountains merge into the Amazon Basin. Because of the extremes of altitude and precipitation the grass flora is large and varied. This paper includes 124 genera and 605 species, of which 29 species are new.

Alfalfa in Nebraska, T. A. KIESSELBACH and A. ANDERSON (*Nebraska Sta. Bul.* 222 (1927), pp. 27, figs. 6).—Information on the varieties and seed sources, production and harvesting practices, and feeding value of alfalfa is largely summarized from the extensive report noted earlier (*E. S. R.*, 56, p. 734).

Sterility and inbreeding in beets, E. REED (*Mem. Hort. Soc. New York*, 3 (1927), pp. 59-63).—Experiments by the author showed beets to be normally self-sterile, the sterility being due to the protandrous character of the flower. Isolated plants bore few or no seed, and seed set were probably due to insects. A striking increase in seed yield followed cutting back the apical buds of the main stems, especially where the plants were loosely hooded.

The starch industry in Hawaii (*Honolulu: Waimea Starch Co.*, 1926, pp. 33, figs. 6).—This brief, nontechnical account of the starch industry in Hawaii describes the edible canna (*E. S. R.*, 57, p. 326), practices involved in its culture, harvesting and milling, starch and by-products, and production costs.

Self-sterility or fertility in Trifolium and Melilotus, A. J. PIETERS (*Mem. Hort. Soc. New York*, 3 (1927), pp. 285-288).—While red clover (*T. pratense*) seed may be produced by self-fertilization, seed produced in the open field is prevallyingly, if not nearly always, the result of cross pollination. Although *T. multinerve* was observed to be definitely self-fertile, little information is available on other species of Trifolium.

M. alba seems to be definitely highly self-fertile, the degree of self-pollination varying with conditions. "The fact that a dwarf variety, as the Grundy County, retains its varietal characteristics would seem to indicate that self-fertilization is the rule rather than the exception in this species." *M. officinalis* is certainly prevallyingly self-sterile, although work on artificial self-pollination is needed for final conclusions.

Root development of cotton on Cecil sandy loam during 1926, G. H. COLLINGS and J. D. WARNER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 839-842, figs. 5).—Observations on the root systems of Cleveland cotton plants growing under normal field conditions at the South Carolina Experiment Station on Cecil sandy loam in 1926, a year with a very dry spring and summer, showed the development of the root systems of plants of the same age and size to be very uniform. The small extent to which the soil was occupied by roots was noteworthy. The greater portion of the development of the root system was confined to the surface 8 in. of soil, although many roots of mature plants reached a 1-ft. depth. The greatest depth reached by any root was 2 ft. Very few roots of mature plants extended in a lateral direction over 2 ft. from the center of the plant. Greater root development in the neighborhood of previously applied fertilizer was not observed, and the root development above the fertilizer was slight.

The indigenous cotton types of Burma, T. D. STOCK (*India Dept. Agr. Mem., Bot. Ser.*, 14 (1927), No. 5, pp. 175-187, pls. 5).—Plant, seed, and lint characters of 20 types of cotton, variously assigned to species of *Gossypium*, are described, with appropriate illustrations.

The culture and preparation of kapok in Java [trans. title], Y. HENRY (*Bul. Econ. Indochine, n. ser.*, 30 (1927), No. 187, pp. 399-412, pls. 23).—A prac-

tical account of the status of kapok production in Java, detailing cultural and harvesting practices and preparation of the fiber for market.

Distinguishing the seed of *Poa pratensis*, *P. trivialis*, and related *Poa* species [trans. title], K. V. KAMENSKIĖ (K. W. KAMENSKY) (*Zap. Semenovedeniĭa*) (*Ann. Essais Semences, Jardin Bot. Leningrad*), 5 (1927), No. 3, pp. 17-38, figs. 9; *Ger. abs.*, pp. 35-38).—The characteristics of the seed of certain *Poa* species are described and illustrated.

Types of sterility in wild and cultivated potatoes, C. F. CLARK (*Mem. Hort. Soc. New York*, 3 (1927), pp. 289-294).—Observations (E. S. R., 51, p. 231) on cultivated varieties, wild species, and species hybrids pertaining to the tuber bearing section of the genus *Solanum* revealed the existence of four types of sterility. Inhibition of fruitfulness resulting from premature abscission of buds and flowers occurred in *S. tuberosum*, and pollen abortion or intersexualism was present in all varieties of this species. Pollen sterility, probably of this type, was also present in *S. commersonii*. Sterility of hybrids involving both male and female organs was found. Physiological incompatibility caused complete self-sterility and also cross-sterility except in certain combinations of crosses. This type occurred in *S. caldasii glabrescens* and in *S. chacoense*.

[Potato experiments in New Brunswick], C. F. BAILEY (*Canada Expt. Farms, Fredericton* (N. B.) *Sta. Rpt. Supt.* 1926, pp. 29-38, 52-54).—The reported experiments with potatoes included dates of planting and harvesting, size of seed, spacing, cultural, and fertilizer trials. See also a previous note of earlier work (E. S. R., 56, p. 636).

Sprouting increased the crop of Irish Cobblers for early digging, whereas for late digging the crop was larger from unsprouted seed. Sprouting always increased the crop of Green Mountains. Irish Cobbler seed from late plantings gave a little better yield than seed from early plantings, while seed from late planted Green Mountains has not increased the yield on the average. Green Mountain potatoes dug early produced a better crop than those dug late in the season. No reduction was observed in the marketable yield from small tubers or from small tubers selected from a crop from small tubers, although continuous selection of small tubers for 4 years apparently resulted in such reduction in two of three plats and in an increased percentage of small tubers with the total yield about the same. On land comparatively weed-free, potatoes in a 3-year rotation produced similar marketable crops from one, two, and three cultivations and slightly less from four.

Comparisons of methods indicated that when 1,500 and 2,000 lbs. of fertilizer per acre are applied for potatoes application in the row and mixing with earth will give the best results. When fertilizer salts were applied in the row in contact with the seed and the other constituents usually found in a ton of 4-8-10 fertilizer were broadcast, ammonium sulfate and sodium nitrate apparently reduced the percentage stand, and while potassium chloride did not depress the stand much, its use was accompanied by the lowest yield. Best results were had with acid phosphate applied in the row and the other chemicals broadcast. Yields with fertilizer applied below the sets were slightly larger than with it above the sets.

Self fertilization and inbreeding in rape (*Brassica napus oleifera*) [trans. title], N. SYLVÉN (*Nord. Jordbrugsforsk.*, 1927, No. 3, pp. 265-280).—Nine years' study with rape at Svalöf showed that rape is a self-fertilized plant, with effective open pollination seldom occurring. Isolation in parchment bags under favorable weather conditions resulted in the production of plenty of good seed. Only in wet summers when rain fell during isolation were the bagged seed somewhat inferior to the best unisolated seed. Plants grown from

isolated seed were generally equal to comparable open-pollinated seed from the same mother plant.

Lines of different rape types grown from seed subjected to continuous isolation for several years exhibited no ill effects from inbreeding. Both strong and weak developmental types could be isolated, i. e., both pronounced vegetative and seed types. Natural hybrids (F_1) found in the progeny of open-pollinated seed showed that heterosis could affect the vitality of the progeny either favorably or unfavorably. Analyses of segregating lines of different hybrids demonstrated in certain cases a strengthening effect of heterosis and in others a weakening effect on the vitality of the rape.

Time and rate of blooming in rice, H. H. LAUDE and R. H. STANSEL (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 781-787).—Observations on 45 panicles, including 7,902 florets and representing 6 varieties or selections grown on the Beaumont, Tex., Substation, showed that no blooming took place before 8 a. m. and none after 4 p. m., while the peak occurred between 11 a. m. and 12 m. Most of the rice panicles completed blooming in 6 or 7 days, with the maximum number of florets opening on the second or third day after blooming started. Blooming usually began the first day after the condition of full boot was reached. The terminal florets and a floret about half way down the branch bloomed first, and the process then proceeded both ways from the latter point. The second floret and some at the base of the branch were the last to bloom. In the few cases observed, blooming required from less than 1 hour to 2 hours.

A systematic arrangement of the florets was observed in the main and secondary branches. Rate of panicle development differed among the varieties, being positively correlated with the rate of vegetative growth throughout the season.

A scheme of classification of the varieties of rice found in Burma, R. A. BEALE (*Agr. Research Inst., Pusa, Bul.* 167 (1927), pp. 14, pls. 4).—The simple scheme of classification presented is intended to form certain definite standard types to one of which any variety must belong rather than to study in detail each individual character of each variety.

Spacing experiments with sugar beets in Moravia in 1924 and 1925 [trans. title], F. CHMELAR, J. ŠIMON, and F. MIKOLÁŠEK (*Ztschr. Zuckerindus. Česloslovak. Repub.*, 51 (1927), Nos. 51, pp. 697-706; 52, pp. 709-724).—Continued tests wherein Dobrowitz and Schrelber sugar beets were grown in rows from 40 to 60 cm. apart and 25 and 30 cm. apart in the row gave results in general agreement with previous work (E. S. R., 52, p. 339). Considering results during the period 1922-1925, rows 40 to 45 cm. wide seemed satisfactory for the rich soils of the Moravian beet sections and 45 to 50 cm. wide in drier and poorer soils. From 25 to 30 cm. apart within the row appeared adequate. Beets may advantageously be grown in 50-cm. rows, any loss due to the increased spacing being offset by the economy in hand labor by the use of machinery and by the better use of fertilizers, cultivation, and delayed harvest.

Handbook of sugar beet culture, T. ROEMER (*Handbuch des Zuckerrübenbaues*. Berlin: Paul Parey, 1927, pp. [5]+366, pls. 8, figs. 66).—Together with A. Schaumburg, the author presents to the sugar beet grower a comprehensive handbook which treats in detail the development of sugar beet, its agricultural and industrial importance, origin and history, anatomy and physiology, its soil, climatic, cultural, and fertilizer requirements, harvest practices, varieties, diseases, and by-products. The breeding of sugar beets has been discussed in a publication by Fruwirth (E. S. R., 51, p. 137). Extensive lists of literature cited supplement each chapter.

Data and charts on quality of cane of Hawaiian plantations, 1908 to 1926, compiled by W. L. McCLEERY (*Hawaii. Sugar Planters' Sta. Circ.* 49

(1927), pp. 107, figs. 52).—The quality ratio charts presented cover three periods, 1908–1914 for 27 factories or plantations, 1915–1920 for 39 factories, and 1921–1926 for 41 factories. Tabulated data are given for the two latter periods.

Assimilation of fixed nitrogen by Havana tobacco, A. B. BEAUMONT and G. J. LARSINOS (*Science*, 66 (1927), No. 1706, p. 237).—Experiments at the Massachusetts Experiment Station on the assimilation of different forms of combined nitrogen by Havana tobacco gave results proving the ready assimilation of urea nitrogen in the unchanged form. Plant growth, however, was not as rapid with urea as a nitrogen source as with sodium or calcium nitrate.

[**Tobacco investigations in Canada in 1926**], C. M. SLAGG (*Canada Expt. Farms, Tobacco Div. Rpt. 1926*, pp. 32, figs. 10).—Continued investigations in 1926 at Ottawa and Harrow, Ont., Farnham, Que., and elsewhere in the Dominion were similar in scope to work already recorded (E. S. R., 56, p. 638). The status of the crop and trade conditions are summarized, together with observations from a field survey of tobacco diseases.

Experiments at Ottawa on seed-bed soil showed 20 minutes to be the minimum time for steaming at 50 lbs. pressure necessary for the control of both *Thielavia* root rot and weeds. Treatments of seed-bed soils and seed with various disinfectants were inconclusive. Limited tests indicated that the effects of frost on tobacco seed are not uniform, differing with the variety, degree of cold, and maturity of the seed. Seed from flower heads left bagged to seed maturity averaged about 10 per cent higher in germination than seed unbagged after fertilization.

Studies of the influence of maturity, topping, and suckering on the nicotine content of *Nicotiana rustica* Ephrata demonstrated that the nicotine content increased with maturity in both leaf and stalk. Topping and suckering seemed to increase markedly the nicotine content in both leaf and stalk, and of the two operations with this variety suckering was of the greater importance in producing nicotine. The nicotine yields of seven varieties of *N. rustica* at Harrow in 1925 are tabulated.

Organic and inorganic seed treatments were inconclusive at Farnham except that mercuric chloride and silver nitrate seemed to delay germination and to produce late seedlings. Among the chemicals tested for soil sterilization, formalin again excelled. The cost of production of seedlings was \$1.10 per 1,000 plants in 1926. The use of commercial fertilizers in addition to manure again improved both yield and quality of cigar binder tobacco, whereas the addition of lime lowered both yield and quality of cured leaf. Potassium sulfate surpassed the carbonate, but a fertilizer mixture lacking potassium practically equaled one containing potassium. Use of a mixture lacking phosphate, however, decreased yield by 350 lbs. per acre. Broadcasting the fertilizer gave a slightly greater yield than drilling in the row. The use of sodium nitrate (4 lbs. in 45 gal. water) in the barrel at planting increased the yields, and spent hops and yeast showed considerable fertilizing value for tobacco.

The glass-covered semihotbed was again the most efficient of the types tested at Harrow. Preparation of this type of bed in the fall has been satisfactory provided the bed is covered with straw after steaming to exclude wind-blown material. Sodium nitrate surpassed potassium sulfate and acid phosphate singly and in combination when applied to seed beds to hasten growth and increase plant vigor. Spacing tests indicated that the closer tobacco is planted up to 18 in. in the row the larger becomes the yield and the brighter the cured leaf color. Drilling fertilizer was found more profitable than broadcasting. Hickory Pryor and Warne again proved the best of the flue-cured varieties. Broadleaf Resistant, Standup Resistant, and Stat n Standup gave the most

satisfactory results among the Burleys, and Little Hill, Greenwood, and Yellow Pryor appeared to be the best of the Green River sorts tested.

Variety tests, cost-of-production studies, spacing experiments, and time-of-harvest trials were also carried on in the Okanogan Valley in 1926 under the supervision of the Summerland, B. C., Station.

Tobacco number (*Philippine Agr. Rev.*, 20 (1927), No. 1, pp. 184, pls. 15, figs. 12).—These pages embrace the following articles on tobacco in the Philippines: Notes on the Manufacture of Tobacco in the Philippines, by D. B. Paguirigan (pp. 5-81); A study of the Cost of Production of Tobacco in the Cagayan Valley, by D. B. Paguirigan and U. V. Madamba (pp. 83-115); Wrapper Tobacco Production at the Pikit and Sarunayan Tobacco Experiment Stations and Its Relation to the Philippine Tobacco Problem, by M. E. Gutierrez (pp. 117-133); The Bureau of Agriculture's Work on Tobacco (pp. 135-167) and An Index to Bulletins, Circulars, and Articles on Tobacco Published by the Bureau of Agriculture (pp. 179-184), both by E. R. Alvarado; A Guide [for] Visitors to the Ilagan Tobacco Experiment Station of the Bureau of Agriculture at Ilagan, Isabela (pp. 169-174); and A Guide for Visitors to the Tobacco Experiment Station of the Bureau of Agriculture at Sarunayan, Dulauan, Cotabato (pp. 175-177).

A comparative study of strains of Marquis wheat, J. B. HARRINGTON (*Sci. Agr.*, 8 (1927), No. 2, pp. 77-104, figs. 6).—Morphological and agronomic characters and the milling and baking qualities of 15 strains, supposedly of Marquis wheat, are described from studies made at the University of Saskatchewan. Observations were made in some detail on type progenies in a strain known as Saskatchewan 7. The secondary glume of a spikelet about one-third of the distance up from the base of the spike appeared accurate enough for use in measuring the glume characters of a plant.

Varieties of wheat in New South Wales, J. T. PRIDHAM (*N. S. Wales Dept. Agr., Farmers' Bul.* 153 (1927), pp. 41, figs. 36).—Sixty-one varieties are described.

Pre-harvest factors which affect wheat quality, C. E. MANGELS (*Cereal Chem.*, 4 (1927), No. 5, pp. 376-388, figs. 4).—The effects of the more important preharvest factors affecting the quality of wheat are discussed in terms of test weight and protein content, largely from results obtained by the North Dakota Experiment Station.

Suitable varieties of wheat are essential to quality. The protein content of the seed did not appear to influence the protein content of the resulting crop. Variations in temperature and rainfall profoundly affect the quality of wheat. The effect of high temperature is to increase protein and decrease test weight, and an increase of moisture evidently decreases the protein content. The critical period for wheat is the two or three weeks just before harvest, i. e., for the spring wheat crop the month of July, and for winter wheat, the month of June. Soil fertility, crop rotations and sequence, and tillage all appear to affect the test weight and protein content.

Conferences on the milling and baking of wheat [trans. title], H. D'ANDRE (*Rev. Facult. Agron. La Plata*, 3. ser., 17 (1927), No. 2, pp. 145-236).—This discussion deals with the classification of wheat, industrial characteristics of the principal varieties and types, defects and impurities, the influence of environment on composition, and the processes of milling and baking.

Effect of fertilizers on the germination of seeds, J. L. MAXTON (*Soil Sci.*, 23 (1927), No. 5, pp. 335-341).—Experiments at the Virginia Polytechnic Institute wherein seeds of grasses and clovers were sown in mixture with a series of fertilizer materials similar to a farm practice current in some sections indicated that the mixing of seeds and dry fertilizers together for from 1 to 4 weeks

does not injure the seeds to any noticeable extent. The injury to germination observed occurs after the seeds are placed in moist soil and not before seeding. Some fertilizers cause greater reduction in germination than others, and certain seeds show greater germination losses than others because of contact with fertilizers in the soil. The fertilizer injury seems to be prevention of germination of the seed rather than destruction of the seedling before it emerges above the soil surface.

The control of the wild form of cultivated garlic, A. A. HANSEN (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 854, 855).—Land solidly infested with garden garlic (*Allium sativum*) was so plowed in mid-November as to expose as many bulbs as possible to frost, and the tops were turned completely under and again plowed during May. Although a noticeable decrease occurred in the stand of garlic, it was not completely eradicated until the process had been continued for three years. For small areas, saturating the tops with waste motor oil applied with a sprayer or sprinkling can during April has been found effective, whereas for larger infested areas the method as outlined above appears advisable.

HORTICULTURE

Experimental studies of cultivation of certain vegetable crops, H. C. THOMPSON (*New York Cornell Sta. Mem.* 107 (1927), pp. 73, figs. 37).—Comparative yield records taken upon vegetables growing on contrasting areas one of which was cultivated thoroughly at weekly intervals and the other simply scraped at the surface to destroy weeds indicated that weed control was the more important factor. With three species, carrots, cabbage, and tomatoes, cultivation failed to give any significant increased yield. With beets, onions, and celery the increases in favor of tillage were 4.25, 7.69, and 24.09 per cent. With the exception of celery all the crops gave larger yields in some years on the scraped areas. Observations upon an area allowed to go to weeds showed the great value of eliminating such plants. In the case of beets the destruction of the weeds increased the yields 550 per cent, as compared with 4.25 for tillage.

Moisture determinations made at frequent intervals indicated that soil mulch does not always result in moisture conservation. In 79 of 280 readings the scraped plats were ahead and in 13 cases equaled the tilled. Temperature records showed a higher average at 3, 5, and 6 in. in tilled than in scraped plats. Nitrate nitrogen determinations during the 1925 season showed a slight advantage for tillage when cultivated plats were compared with scraped fallow areas. No significant differences occurred in nitrates in planted areas except in the case of staked tomatoes, where the tilled soil averaged higher. In 12 out of 17 cases a positive relation was found between moisture content and the quantity of nitrates.

Observations upon the root systems of the several species indicated that those plants with widely extended and well-distributed roots benefit the least from tillage. Celery and onions, the plants which benefited the most from cultivation, were also least injured by cultivation, due to the narrower spread of the roots. Concluding, the author points out that cultivation is of benefit to vegetables very largely because of weed control and that deep tillage usually is not justified on account of root destruction.

Chemical fertilizers for greenhouse lettuce, J. H. GOUBLEY (*Ohio Sta. Bul.* 408 (1927), pp. 22, figs. 5).—The results of experiments undertaken to determine to what extent chemical fertilizers, lime, and green manures may be substituted for animal manures in the production of greenhouse lettuce indicate that, with soils such as used, heavy annual applications of 1 ton of 3-12-4 or 3-7-9

(N-P-K) per acre of complete chemicals plus a turned-under crop of soy beans may produce crops averaging 80 per cent as large as those obtained from 30 tons of manure per acre and in certain seasons almost equal the yields from manure. It is suggested that in event of manure shortage half the material supplemented with 0.5 ton of high-grade chemical fertilizer should give excellent results.

Complete fertilizer composed of nitrate of soda, acid phosphate, and muriate of potash proved superior to any single ingredient or to a combination of nitrogen and phosphorus or nitrogen and potash. Nitrate of soda used alone failed to increase yields and in fact depressed them about 8 per cent below the control. Acid phosphate used alone in the same series gave a 26 per cent increase and lime a 15 per cent increase.

In respect to soil reaction the strongly alkaline soils used produced no deleterious effect provided ample plant foods were present. Not until a pH value of nearly 8.5 was reached was there any indication of lime injury manifested in spotting and injury to the edge of the leaves.

Experiments with cottonseed meal in mushroom culture, F. C. STEWART (*New York State Sta. Bul.* 546 (1927), pp. 38, pl. 1).—Of three composts, (1) a fermented mixture of bean straw and tree leaves, (2) fermented horse manure from stables bedded with sawdust, and (3) same as (2) with cottonseed meal added at the rate of 67 lbs. per 100 cu. ft., used in the winter of 1925-26 for the growing of mushrooms beneath a greenhouse bench, only the third gave any worth-while yields. The bean straw-tree leaf mixture was a total failure.

Records taken in the 1926-27 season upon beds made from composts of fermented horse manure (oat straw), with and without additional cottonseed meal, showed 1.08 lbs. per square foot for the cottonseed bed and 0.17 lb. for the manure alone, suggesting that cottonseed meal may have a potential value in mushroom culture.

Carbon dioxide for forcing tomatoes [trans. title], M. LÖNNER (*Obst. u. Gemüsebau*, 73 (1927), No. 19, pp. 300, 301).—Comparative records taken upon tomatoes growing in two small greenhouses, constructed and situated as nearly alike as possible and one supplied with carbon dioxide, showed profitable increased yields from the gas treatment, even after making due allowance for the cost of the gas and the depreciation on equipment. The increases in ripe fruits were 20.8 and 25.2 per cent, respectively, for Bonner Beste and Tuckswood varieties. The author believes that increases of 100 per cent claimed by some are not possible if the tests are carried through to the end of the fruiting period.

Progress in fruit breeding, G. M. DARROW (*Jour. Heredity*, 18 (1927), No. 7, pp. 288-304, figs. 10).—A survey of the extent and the results of fruit breeding work in the agricultural experiment stations and in the U. S. Department of Agriculture, with special reference to those varieties which have attained commercial importance.

Fruit varieties in Ohio, II, J. S. SHOEMAKER (*Ohio Sta. Bul.* 407 (1927), pp. 13, figs. 7).—This bulletin, the second in a series upon special varieties (E. S. R., 55, p. 39), discusses eight promising fruits, namely, the Wilma and Salberta peaches, Brassington cherry, Latham red raspberry, Tragedy and Imperial Epineuse plums, Mastodon strawberry, and the Lucile grape.

Factors affecting the variable growth of apple grafts in the nursery row, R. H. ROBERTS (*Wisconsin Sta. Research Bul.* 77 (1927), pp. 16, figs. 15).—Following an earlier account (E. S. R., 53, p. 843) in which it was shown that better growth occurred in those apple grafts in which the top bud of the scion was directly in line with or above the point of the callus union along the matched sides of the tongue, a more complete study was undertaken in 1926

with the top bud (1) above the matched side of the tongue, (2) above the lip of the scion, (3) above the mismatched side of the tongue, and (4) above the lip of the stock.

The stand and the growth of the grafts varied significantly with the position of the bud, the differences being more evident in the case of large size than small size stocks. Galling was also apparently influenced by bud position, the lowest per cent being in the case of lot 1. Within a single bud position galled trees did not average smaller than nongalled trees. Of three root sizes, second piece, piece root, and crown piece, the last named gave considerably the larger trees, due, in the author's belief, to an earlier start and a more rapid early season rate of growth.

Records taken on four varieties worked on Doucin and French seedling stocks showed more uniformity in the case of Doucin roots. The variation in size of young nursery trees is believed to be due more to the scion than the stock. Time of starting growth is deemed a controlling factor, small trees being small because they start late rather than that they stop early. Contrary to the behavior of seedling rooted trees, the Doucin stocks were not much changed by the scion variety.

The relation of scion variety to character of root growth in apple trees, T. SWARBRICK and R. H. ROBERTS (*Wisconsin Sta. Research Bul. 78 (1927)*, pp. 23, figs. 19).—Observations upon the root development of nursery trees of a large number of apple varieties showed that in almost all cases the scion exerts a well defined influence upon the roots, upon the size of the root system, upon the proportion of coarse to fibrous roots, upon the general direction of root growth, and upon the point of origin of the large lateral. No correlation was noted between the size of the top and the size of the roots. The characteristic root differences persisted in various soil types.

In the case of trees budded at some distance above ground no influence of the scion on the roots was apparent, a wide variability comparable to that of seedlings being observed. In the case of double worked trees the root character was typical of the variety holding the intermediate position.

Observations upon the numbers of vessels, parenchyma, and fiber cells and upon the ratio of fiber to parenchyma in the seedlings and the roots produced after working to a variety indicated that the scion influences in a marked way the anatomy of the roots when the graft is placed directly upon the roots. Little influence was noted where there was an intermediate piece of stem between the root and the scion. The authors believe that the influence of vegetative root stocks is due to a stem effect, and suggest that double working might result in a similar uniformity in a much more commercially practical way.

Ringling applied to the commercial orchard, J. H. GOURLEY and F. S. HOWLETT (*Ohio Sta. Bul. 410 (1927)*, pp. 24, figs. 9).—That ringling is commercially practical in the case of filler apple trees which have failed to come into prompt fruiting and must of necessity be shortly removed from the orchard is concluded as a result of experiments at the station and in commercial orchards. Varieties such as Baldwin and Liveland Raspberry, notably slow to bear, were particularly benefited by the treatment.

Studies of methods of technique suggest that drawing a knife blade around the limb deep enough to sever all the bark tissues is effective and also quick to heal. In northern Ohio ringling should be done in late May or early June. The ringling of one or two of the main limbs per year is recommended as preferable to ringling the main trunk.

Observations upon the growth of the treated limbs showed a reduced leaf surface the season following the ringling, due to a partial failure of lateral buds

to develop. No effect was noted upon color of foliage or time of leaf abscission. Following abundant flower formation on the ringed limb, there was usually a definite reduction in the average area of the leaves on the nonflowering terminals, a behavior not dissimilar to that of any fruiting limb. No significant reduction was found in the average length of the nonflowering terminals of the ringed and unringed portions of the same tree. Most varieties responded to ringing by forming fruit buds not only terminally on spurs and on long and short shoots but also as axillary or lateral buds. Vigorous trees developed a normal set of fruit which was normal in size, flavor, and keeping quality.

Apple growing in the Mount Etna region [trans. title], G. SAVASTANO (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale*, 8 (1926), pp. 1-39, pls. 4).—A general account pertaining to soils, culture, varieties, methods of pruning, spraying, harvesting, etc.

Cold storage investigations, season 1926, L. W. TILLER (*Cawthorn Inst., Nelson, N. Z., Dept. Chem. and Agr. Bul. 6, n. ser.* (1927), pp. 16).—A further report (*E. S. R.*, 57, p. 139), in which it is stated that the work of 1926 was mainly a repetition of the preceding year's experiments. It further emphasized, however, the fact that flesh collapse in stored apples is primarily due to too low a temperature, and that the trouble is greatly accentuated by excessive humidity. Some evidence was obtained to suggest that the soil management of the orchard has an important bearing on the behavior of the stored fruit, greater resistance to breakdown being observed in fruits from cover cropped and manured orchards.

Cool storage of New Zealand apples (*Cold Storage*, 30 (1927), No. 354, p. 290).—A consignment of Sturmer, Statesman, and Rome apples arriving in Southampton, England, June 8, after shipment in a ship hold the average temperature of which was 35° F. at the top and 33° at the bottom, kept satisfactorily in cold storage at 34° until the end of July.

Periodicity of the bud development of the pear [trans. title], I. LUYTEN and E. DEVRIES (*Verhandel. K. Akad. Wetensch. Amsterdam*, 2. Sect., 24 (1926), No. 4, pp. 60, pls. 6, figs. 2; *Eng. abs.*, pp. 45-52).—Herein are presented the data of a study conducted at the Laboratory for Plant Physiology, Wageningen, Netherlands, upon leaf and flower bud development in the Beurré Hardy pear. The beginning of flower bud formation in the 1923 season occurred from August 24 to September 1, considerably later than was anticipated from the results of other studies. Contrary to the findings of Goff (*E. S. R.*, 13, p. 18), only one period for the beginning of differentiation was observed.

Investigations on the harvesting and handling of Bosc pears from the Rogue River Valley, H. HAETMAN, J. R. MAGNESS, F. C. REIMER, and M. H. HALLER (*Oregon Sta. Bul.* 228 (1927), pp. 30, figs. 4).—This bulletin is prepared in two parts.

The first of these, entitled *Harvesting and Storage at Shipping Point*, by Hartman and Reimer, includes the results of tests of the effect of the time of picking upon the dessert and keeping qualities of Bosc pears and the results of studies of methods of handling pears prior to shipment. The harvesting period as regards the development of high quality was relatively brief, averaging only 10 to 15 days in any single orchard. Fruits harvested in this period also kept longer without breaking down. Used with due care, pressure testers proved valuable indicators of picking maturity. Cold storage tests showed that Bosc pears harvested at the proper time and stored immediately keep well and develop fairly good quality even after 120 days at 32° F. After-storage temperatures of 60-70° were required for satisfactory ripening. Although delayed storing favorably affected the ultimate quality of early harvested pears, no

effect was noted on fruits harvested at midseason or later, and the keeping quality was impaired. The tendency for Bose pears to wilt was overcome in the case of paper-wrapped fruits maintained in a relative humidity of 76-80 per cent.

In part 2, Transportation and Storage Following Eastern Shipment, by Magness and Haller, it was again found that the longest possible storage season for Bose pears results from immediate and sustained storage near 32° and that an after-storage of 65-70° is required to obtain maximum quality.

Because of temperature variations within cars Bose pears carried in the top layers of nonprecooled refrigerator cars kept almost 1 month less than did fruit from the bottom of the car. The difference in position made a difference between the Thanksgiving and the Christmas markets. Delays in transferring fruit from the car to storage after arrival materially shortened the possible keeping season. Storage at 40° did not increase ultimate quality but did greatly reduce the length of the possible storage period.

Plum pollination studies [trans. title], E. H. FLORIN (*Meddel. Perm. Kom. Fruktodlingsförsök [Sweden]*, No. 12 (1927), pp. 60, figs. 10; *Eng. abs.*, pp. 55, 56).—In connection with a review of the results of plum pollination studies in Europe and North America it is pointed out that Swedish investigations have shown most varieties of plums to be self-sterile from a commercial viewpoint. Two varieties, common yellow and Drap d'Or d'Esperen, were marked by the absence of true stamens, these organs being replaced by small petaloid scales. Reine Claude d'Oullins proved to be a satisfactory pollinizer for Drap d'Or d'Esperen. Victoria was the only variety found capable of pollinating Jefferson. Kirke crossed with Belgian Purple gave abundant fruit. Hackman, Reine Claude d'Althann, Reine Claude d'Oullins, and Victoria all proved satisfactory pollinizers for Reine Claude.

Management methods in the raspberry plantation, A. H. TESKE and V. R. GARDNER (*Michigan Sta. Spec. Bul.* 165 (1927), pp. 34, figs. 5).—Information obtained in several raspberry plantations representative of the industry showed striking differences in the cost of production and in net returns. Yield, pointed out as the determining factor in the success or failure, was largely influenced by the location of the plantation in respect to air drainage and the character of the soil. The number of canes per given area was an important factor in yields, the records indicating that 5,000 to 8,000 canes per acre are required for maximum production. A planting distance of 8 by 3-4 ft. is suggested. Diseases were found to be a disturbing factor in raspberry growing, often greatly limiting yields and the life of the plantation. Most of the black raspberries studied were of the Cumberland variety. Red raspberries cost slightly more to harvest but sold at distinctly higher prices than did the blacks.

Manurial trials on fig (*Bombay Dept. Agr. Ann. Rpt.* 1925-26, p. 210).—Studies at the Modibag Agricultural College, India, showed 30.23, 40.75, 33.13, and 34.82 per cent of sugar, respectively, in fruits harvested from trees fertilized with superphosphate, ash, dried fish, and basic slag.

The cultivation of papaya and the preparation of papain, F. A. STOCKDALE (*Ceylon Dept. Agr. Leaflet* 44 (1926), pp. 5, figs. 2).—A brief popular discussion.

Recent trials with pineapples (*Ceylon Dept. Agr. Leaflet* 42 [1926], pp. 4).—Records taken upon test plantings of pineapples in four locations in Ceylon indicated that pineapple culture may be profitably undertaken to the point at least of supplying the local demand for fruits. The use of Pabco paper mulch at Peradeniya gave slight but not profitable increased yields.

Pecan culture in Italy [trans. title], G. SAVASTANO (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acreale*, 8 (1926), pp. 65-87, pls. 8).—Based upon information acquired on a trip to the pecan producing sections of the United States,

the author discusses the soil, climatic, cultural, propagation, and pollination requirements of the pecan, with a view to stimulating interest in this nut in Italy.

Sterility in the pistachio in Sicily [trans. title], G. SAVASTANO (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale*, 8 (1926), pp. 57-64, fig. 1).—In a 15 to 18 per cent sugar solution at a temperature of 20-25° C. (68-77° F.) pollen of terebinth, pistachio, and two pistachio hybrids gave 67, 56, 47-52, and 27-31 per cent of germination, respectively. Under good conditions pistachio pollen kept 15 to 20 days in the laboratory but was killed by a few hours' exposure to direct sunlight. A comparison of terebinth and true pistachio pollen for pollinating true pistachio flowers gave 27 and 65 per cent of well filled fruits, respectively, but the experiment repeated on flowers of a hybrid pistachio gave better results from the terebinth than from the true pistachio pollen. Empty and partially filled nuts are attributed chiefly to imperfect pollination, but unfavorable climatic conditions and abortive ovules are also believed to play a part. It is advised that one male tree of good pollinating capacity should be planted for every 4 to 6 female trees.

Walnut drying and packing in Oregon, E. H. WIEGAND (*Oregon Sta. Bul.* 227 (1927), pp. 28, figs. 16).—For the most part this bulletin contains general information upon the construction and operation of various driers used in Oregon for curing Persian walnuts. Methods of bleaching, grading, handling, and storing of nuts are also discussed. Of four types of driers, namely, the Oregon tunnel, the kiln, the recirculated Oregon tunnel, and the recirculated bin types, the last named was by far the most rapid, taking at 100° F. about one-half the time required by the slowest type, the Oregon tunnel. Records taken over a period of 26 hours of drying showed the fastest rate of water loss during the initial few hours. Freshly harvested nuts were found to vary from 36 to 48 per cent total moisture, depending upon the weather, location of the orchard, etc.

The propagation of hardy trees and shrubs, G. C. TAYLOR and F. P. KNIGHT (*London: Dulau & Co., 1927, pp. 120, pls. 8*).—This comprises general information for the nurseryman and the professional gardener.

Shrubs, F. F. ROCKWELL (*New York: Macmillan Co., 1927, pp. X+76, figs. 17*).—Practical information is given upon the utilization, methods of planting, pruning, and after care of shrubs.

Ornamental trees, shrubs, and woody climbers, W. T. MACOUN (*Canada Dept. Agr. Bul. 89, n. ser. (1927), pp. 52, figs. 23*).—Descriptive and varietal notes are given upon a large number of trees, shrubs, and other woody plants which have proved hardy at Ottawa, Canada.

The labour-saving garden, F. TOWNSEND (*London: Sidgwick & Jackson, 1927, pp. VII+248, figs. 29*).—This small handbook contains practical information on the growing of flowers, fruits, and vegetables in the small garden.

Gladiolus, F. F. ROCKWELL (*New York: Macmillan Co., 1927, pp. IX+79, figs. 12*).—A small handbook devoted to culture, varieties, propagation, exhibits, etc.

Gladiolus fertilizers, A. LAURIE (*Amer. Florist*, 69 (1927), No. 2055, pp. 3, 16, fig. 1).—Tests at the Michigan Experiment Station of various materials, namely, lime and ammonium sulfate, hardwood ashes and ammonium sulfate, acid phosphate, acid phosphate and ammonium sulfate, acid phosphate and urea, aluminum and ammonium sulfates, bone meal, and mixed fertilizers, showed remarkable results from the use of acid phosphate. The plants to which the acid phosphate was applied at the rate of 2 lbs. per 50-ft. row had at 6 weeks made approximately twice the growth of any other lot, and the spikes appeared 1 week earlier than the control or bone meal lots. Stable manure used alone

gave good results, but the addition of high nitrogen fertilizers proved detrimental to flower production.

Iris in the little garden, E. P. MCKINNEY (Boston: Little, Brown, & Co., 1927, pp. [10]+114, pls. 4, figs. 9).—A popular treatise on species and varieties, their propagation, culture, and utilization.

Fasciation in Phlox drummondii, J. P. KELLY (Jour. Heredity, 18 (1927), No. 7, pp. 323-327, figs. 3).—A brief discussion of the origin, nature, and inheritance of fasciation in *P. drummondii*.

FORESTRY

What tree is that? E. G. CHEYNEY (New York and London: D. Appleton & Co., 1927, pp. XVI+185, figs. 104).—Illustrated with linear drawings of the leaves and fruit, brief descriptions are given of many of the more common forest trees of the northeastern United States.

Wisconsin trees ([Milwaukee]: Milwaukee Jour. Pub. Serv. Bur., 1927, pp. [8]+148, figs. 100).—Accompanying simple illustrations of the foliage and fruits, popular notes are given upon the early history, distribution, and characteristic uses of Wisconsin trees.

The Gold Coast forest: A study in synecology, T. F. CHIPP (Oxford Forestry Mem. 7 (1927), pp. 94, pls. 5, figs. 29).—A general account of the Gold Coast forests, their location, great density, dependence on rainfall, component species, gradation into open woodlands, etc.

Forest research work in Finland, L. ILVESSALO (Acta Forest. Fennica, 31 (1926), pp. 92).—A historical account of the development of forestry research in Finland and a summary of the results of active and completed investigations.

The selection of high yielding trees on rubber estates, R. A. TAYLOR and T. H. HOLLAND (Ceylon Dept. Agr. Leaflet 43 [1926], pp. 5, figs. 4).—Two methods, employed in selecting high yielding rubber trees for propagation purposes, (a) actual recording of yields and (b) bark examination, are described and discussed.

The growing together of the roots of the Hevea [trans. title], W. BOBILIOFF (Arch. Rubbercult. Nederland. Indië, 11 (1927), No. 8, pp. 347-353, pls. 8, figs. 4; Eng. abs., p. 353).—An examination of the roots of Hevea trees carried out in a search for pathological organisms revealed several instances of natural grafting, not only between the roots of different trees but also between the roots of old stumps and those of living trees, thereby maintaining life in the stump.

Forest products: Their manufacture and use, N. C. BROWN (New York: John Wiley & Sons; London: Chapman & Hall, 1927, 2. ed., rev., pp. XVII+447, pls. 7, figs. 122).—A revised edition of a previously noted publication (E. S. R., 42, p. 44).

DISEASES OF PLANTS

Report of the imperial mycologist, W. McRAE (Agr. Research Inst., Pusa, Sci. Rpts. 1925-26, pp. 54-69).—The main portion of this report deals with diseases of plants, outlining work or information relating to rahar (*Oajanus indious*) wilt (*Fusarium vasinfectum*); sugar cane mosaic; cotton wilt fungus (*Fusarium* sp.); cinchona disease (10 fungi isolated); berseem (*Trifolium alexandrinum*) stem rot (*Rhizoctonia solani*); gram wilt (*Fusarium* sp.); linseed wilt (*F. lini*); mustard smut (*Urocystis corraloides*); ginger helminthosporiose (*Helminthosporium* sp.) and *Panicum frumentaceum* helminthosporiose (*Helminthosporium* sp.); *Phytophthora* spp. (*P. faberi*, *P. palmivora*, and *P. meadii*); cucurbit fruit rot (*Pythium aphanidermatum*, closely allied to *P. butleri*); and wheat foot rot (*Pythium* sp.).

Observations on the growth of *Armillaria mellea* Vahl in culture, H. E. THOMAS (*Phytopathology*, 15 (1925), No. 11, p. 729).—Preliminary experiments are briefly detailed. Varieties known to be resistant show their resistance by the method outlined, in which pieces of live roots and twigs were kept moist in culture tubes and inoculated with *Armillaria*. The results of tests of growth on autoclaved material are detailed.

Epiphytes on cultivated trees, W. N. SANDS (*Malayan Agr. Jour.*, 14 (1926), No. 1, pp. 13-17, pls. 6).—In a short account of the life history of epiphytes on useful trees in the Malayan lowlands, descriptions are given of certain common epiphytic flowering plants and ferns which frequently cause injury to cultivated trees.

The mycelium of *Peronospora pulveracea* [trans. title], H. KLEBAHN (*Ztschr. Pflanzenkrank.*, 35 (1925), No. 1-2, pp. 15-22, figs. 15).—A study is presented of mycelium of *P. pulveracea* between and within cells of *Helleborus*.

Mercury fungicides in repeated use [trans. title], G. GASSNER (*Ztschr. Pflanzenkrank.*, 35 (1925), No. 1-2, pp. 1-15).—Chiefly this account deals with the questions of apparatus and management in connection with the necessity for maintaining concentrations adequate for effective fungicidal treatment of seed.

The estimation of seed injury due to fungicidal treatments [trans. title], G. GASSNER (*Ztschr. Pflanzenkrank.*, u. *Pflanzenschutz*, 36 (1926), No. 1-2, pp. 25-41).—The effects of conditions, concentrations, and durations are noted for several fungicides used as seed treatments.

Seed disinfection.—II, Experiments with mangold and sugar beet seed [trans. title], E. GRAM (*Tidsskr. Planteavl.*, 32 (1926), No. 3, pp. 337-402, figs. 8; *Eng. abs.*, pp. 401, 402).—The present work (*E. S. R.*, 55, p. 146) was directed against root rot in sugar beet and mangold, which within the period 1906-1925 was prevalent during six of these years, and against crown rot, which was prevalent during seven of these years. The latter disease is said to be caused by *Phoma betae*, but to be strictly dependent upon drought and high soil alkalinity.

The dust disinfection was carried out with disinfection machines, which were never more than half filled with seed. Seed germinability which is due to stimulation of the seed by steeping in water is frequently temporary. The stimulated germination following chemical disinfection is due not solely to the steeping, since the germination of dust disinfected seed may be equally accelerated. Hot water treatment was insufficient and dangerous to germination. Formaldehyde, hydrochloric acid, and sulfuric acid (followed by neutralization with lime) were somewhat effective, but not practical. Other materials not recommendable include lime, mercuric chloride, copper sulfate, Porzol, Segetan, Betanal, and Tillantin B. Agfa dust-disinfector, Uspulun, and the dusts 1762 B (Meyer-Mainz) and 225 (Saccharinfabrik-Magdeburg) have caused a remarkable increase in the number of plants and appear promising. Disinfection with Germisan (2 hours, 0.25 per cent) and Tillantin C (1 hour, 0.2 per cent, or dusting with 7.5 to 10 gm. per kilogram of beet seed) proved protective against root rot, increasing the number of plants. In a few cases serious root rot was greatly decreased by these disinfectants.

Preliminary studies on the control of cereal rusts by dusting, C. V. KIGHTLINGER (*Phytopathology*, 15 (1925), No. 10, pp. 611-613).—Striking and promising results were obtained in 1924 from the use of fungicidal dusts for control of cereal rusts, the aim of the work being to determine whether sulfur would prevent rust infection of cereals. This preliminary work included laboratory studies on spore germination in relation to the fungicidal efficiency of

sulfur dusts, greenhouse dusting tests on growing plants, and tests of the efficiency of dusts under field conditions. More extensive tests were planned.

Disinfection studies with Salan [trans. title], E. v. URBÁNYI (*Ztschr. Pflanzenkrank.*, 35 (1925), No. 7-8, pp. 290-296).—Salan, which acts as a positive fungicide, due largely to the factor formalin, and as a catalyzer, due to the presence also of glycerin and common salt, was tested as to its action on cereal stinking smut and its effect on germinability of the grain. The danger to germinability appears to be considerably less than that from formalin alone. A germicidally effective treatment with Salan which is favorable to germinability and germinative vigor, and which is either helpful or not significantly injurious, is a one-hour immersion of the seed grain in a 1.5 per cent solution of Salan.

Studies on the pathogenicity and physiology of *Helminthosporium gramineum* Rab., T. JOHNSON (*Phytopathology*, 15 (1925), No. 12, pp. 797-804).—Low soil temperatures favored infection of barley by *H. gramineum*, the highest infection rate occurring at from 10 to 12° C., and very little at soil temperatures above 20° (68° F.). By removing the hulls from germinating barley seed a high infection rate can be obtained in susceptible varieties. The period of greatest susceptibility in dehulled seed appears to occur just after the coleoptile emerges. At least two physiologic forms of *H. gramineum* probably exist. No conidia could be induced on artificial media.

The loose smut of rye (*Ustilago tritici*), H. B. HUMPHREY and V. F. TAPKE (*Phytopathology*, 15 (1925), No. 10, pp. 598-606, figs. 3).—It is stated that since the observation by Humphrey of rye loose smut in North Dakota in 1913, it has been observed in Illinois, Indiana, Kentucky, Minnesota, Missouri, New York, Oklahoma, Virginia, West Virginia, and Tennessee. Comparative cultural and microscopical studies of this smut and wheat loose smut failed to show any differences. The reaction of rye to invasion by *U. tritici* is similar to that of wheat, except that in rye total destruction of only a part (often the lower third or half) of the head is the rule, whereas in wheat all the florets are usually destroyed. Cross-inoculation experiments with wheat and rye aided in establishing the identity of the two smuts. Varietal-resistance studies showed that of 13 varieties and selections only 2, Rosen (C. I. 195) and Rimpau (C. I. 126) are susceptible.

Rye fusariosis and dry treatments [trans. title], E. SCHAFFNIT and A. VOLK (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 1-2, pp. 42-52).—The dry treatment of rye for fusariosis (*Fusarium nivale*) proved to be fully as efficacious as the soaking method, and is considered as entitled to preferences on account of the advantages claimed.

Loose smut of wheat, I, II, J. C. NEILL (*New Zeal. Jour. Agr.*, 29 (1924), No. 3, pp. 177-187, figs. 2; 30 (1925), No. 3, pp. 167-174, figs. 2).—These two articles deal, respectively, with seed disinfection by hot water and field experiments on seed disinfection by hot water.

It is shown in the first article that presoaking does not, apparently, in itself injure the vitality of the seed, but renders it more sensitive to the action of the higher temperatures in the subsequent dip. A slight advantage was evident in a presoak temperature of 84° F. over a temperature of 63° for 5 to 6 hours when germination was commenced on the day following treatment. With a presoak of 5 to 6 hours at 63° the total germination is unaffected by a subsequent dip of 10 minutes up to 127°, or 5 minutes up to 129°. In each case a further rise of 2° causes a reduction of 3 to 4 per cent, still further rises showing increasing intensity of reduction. Germination speed is in all cases lowered in direct proportion to increase as regards either time or temperature of dip. Quick drying after treatment in an air current at 95 to

100° shows no injurious effect on germination, nor any loss of vitality after storage up to 1 month.

The results detailed in the second article show that a 3-minute dip, following a presoaking of 5 to 6 hours in water at 63°, gave complete loose smut control at 131 and 133°, although a single smutted plant appeared in a sample treated at 135°. With a presoaking of 5 to 6 hours in water at 84°, the 3-minute dip at 129 to 135° gave complete control. A 5-minute dip after presoaking of 5 to 6 hours at 63° gave complete control through a range of 127 to 133°, but again a single smutted plant appeared at 135°. With a presoaking of 5 to 6 hours at 84° the 5-minute dip gave complete control from 125 to 135°. A 10-minute dip at 123 to 131° following presoaking at 63° gave complete control, also at 123 to 131° after presoaking at 84°. Without presoaking only partial control was obtained by dipping for 10 minutes up to 135°. A soaking at 104° for 12 hours gave complete smut control, with a loss of 8.2 per cent of mature plants.

The effects of the treatments on germination were not so clearly defined as were the effects on the smut. This is thought to have been due to the generally low and irregular germination caused by the dry period following sowing. A certain improvement in germination was apparent at dip temperatures below the critical point for complete killing, but above that point there was a loss in germination which increased with both the time and temperature of dip. Apparently it is possible to obtain, within practicable temperature limits, complete freedom from infection with a germination loss less than 10 per cent. The field germination of wheat is not materially affected by postponing sowing up to 4 months after treatment and drying. The loose smut present in the wheat stand shows no correlation with external conditions such as temperature, rainfall, or date of sowing, but depends solely on the amount of infection present in the seed.

Stinking-smut of wheat, I-V, J. C. NEILL (*New Zeal. Jour. Agr.*, 27 (1923), No. 3, pp. 159-167; 30 (1925), No. 5, pp. 302-313, fig. 1; 31 (1925), No. 1, pp. 24, 25; 32 (1926), No. 4, pp. 233-235, fig. 1; 35 (1927), No. 1, pp. 28-34).—The several sections of this account deal respectively with (1) the effect on germination of some seed disinfectants, (2) field experiments on control, (3) field germination of seed treated with formalin and Clarke's wheat protector, (4) experimental results for the season 1925-26, and (5) a summary of three years' experiments on control, and detailed results for the 1926-27 season.

Crown wart of alfalfa in Indiana, J. L. WEIMER (*Phytopathology*, 15 (1925), No. 12, p. 807).—Near Madison alfalfa plants were found to be attacked by what appeared to be crown wart. In the galls the typical fruiting bodies of *Urophlyctis alfae* were abundant. This is thought to be the first appearance of this disease east of the Rocky Mountains.

A bean disease caused by the virus of sugar beet curly-top, E. CARSNER (*Phytopathology*, 15 (1925), No. 11, pp. 731, 732).—A severe epidemic disease of beans in Twin Falls County, Idaho, in 1924, was suspected to be of the mosaic type, possibly connected with movements of the leafhopper *Eutettix tenella*, a carrier of curly-top virus to sugar beets. Experiments caging the viruliferous leafhoppers with bean varieties developed the disease, the bean plants in the cages having only nonviruliferous insects remaining healthy. The disease was recovered from the diseased beans and transmitted successfully to healthy sugar beets by means of leafhoppers. A difference in susceptibility between the two bean varieties was indicated by the greenhouse inoculations. Field tests with several bean varieties were instituted.

A new bean disease in Mississippi, H. H. WEDGORTH (*Miss. State Plant Bd. Quart. Bul.*, 6 (1926), No. 3, pp. 6-10, figs. 3).—A snap bean disease due to

Macrophoma phaseoli, said to have been first reported in this country from South Carolina in 1923, reported again from South Carolina in 1925, and reported from Georgia and South Carolina in 1926, appeared at several points in Mississippi during the year 1926. It is not known to attack any crop other than the bean. Symptoms are given. The development of the disease is said to be closely related to weather conditions. It is not known how the disease is disseminated, how varieties respond to its presence, how long the fungus may live apart from its host, or how it may be practicably controlled.

A disease of the betel vine caused by a species of *Phytophthora*, A. THOMPSON (*Malayan Agr. Jour.*, 14 (1926), No. 1, pp. 1-7).—The betel vine or sirih, though it requires plenty of moisture for growth, is sensitive to an excess of water. At Pekan, Pahang, Federated Malay States, the vines which had begun to die owing to heavy rains in October, 1924, were found to contain a *Phytophthora*. This was later obtained in pure culture and studied. It appears to be rather weakly parasitic except when favored by the weakening of the host due to climatic and soil conditions. No specific name has yet been assigned to the fungus.

Center rot of "French endive" or wilt of chicory (*Cichorium intybus* L.), D. B. SWINGLE (*Phytopathology*, 15 (1925), No. 11, p. 730).—Endive rots at the Montana Experiment Station are described as of two types, those affecting chiefly the younger inner leaves and those beginning chiefly on the older leaves. On reinoculation each of these is capable, independently of the other, of producing the regular symptoms of center rot, which is characterized by a yellowish-olive color. Both failed to attack beets, carrots, cauliflower, cucumbers, potato, and turnips, and gave doubtful, probably negative, results on head lettuce and celery. The organisms are described and named as two species, *Phytomonas cichori* and *P. intybi*.

The relation of certain species of *Physalis* to the overwintering of the mosaic disease of cucumber, M. N. WALKER (*Phytopathology*, 15 (1925), No. 12, pp. 733-744, pls. 2).—It was found that mosaic of *P. pubescens* is readily transmitted to cucumber by *Aphis gossypii*, and that cucumber mosaic is transmissible to *P. pubescens* by the same means. Artificial inoculation gives lower infection percentages. Mosaic of pokeweed (*Phytolacca decandra*), tobacco, and tomato are also transmissible to *Physalis pubescens*, but the latter plant, being an annual, does not transmit mosaic through the seed. A mosaic overwinters in the perennials *P. subglabrata* and *P. heterophylla*, which is readily transmitted to cucumber by aphids and by artificial inoculation, and is also transmissible to *P. pubescens*. Field observations indicate that mosaic infection is common on perennial *Physalis* spp. near cucumber fields, and experimentation indicates that these wild hosts constitute an important source of primary cucumber infection.

Browning disease of flax in North America, A. W. HENRY (*Phytopathology*, 15 (1925), No. 12, pp. 807, 808).—The flax browning disease described by Lafferty (E. S. R., 49, p. 543) as the new species *Polyspora lini* has been present in North America since 1920. Specimens collected in that year at Saskatoon, Saskatchewan, remained alive, though kept dry in the laboratory, until isolated in 1924. Diseased flax grown 100 miles north of East Lansing, Mich., from seed obtained in Ontario, showed in 1925 two diseases, rust (*Melampsora lini*) and browning (*P. lini*), the latter disease being new, so far as known to the author, in the United States.

Tip-burn and "slime" diseases of lettuce in California, T. E. RAWLINS and R. L. McCLAIN (*Phytopathology*, 15 (1925), No. 11, pp. 727, 728).—In case of lettuce plants grown in both adobe and composted greenhouse soils, maintained

at different moisture contents, it was found that higher moisture content corresponded to earlier and more severe tipburn. Plants grown in solution culture also burned severely. It is concluded that tipburn can not be controlled by increasing water supply at the root surfaces. Cytological studies of early stages indicate that the first tipburn degeneration occurs usually in the cells adjacent to the vessels at the junction of small marginal veins, this fact indicating a close relationship between the transpiration stream and the degeneration. No correlation with fertilizer was discovered. Generally, conditions promoting succulence favor susceptibility to tipburn. The tipburn tissues are often invaded by *Botrytis* sp. and by bacteria, the secondary invasions producing very destructive rots (slimes).

The mosaic disease in the garden pea and other legumes, S. P. DOOLITTLE and F. R. JONES (*Phytopathology*, 15 (1925), No. 12, pp. 763-772, pl. 1).—Garden pea (*Pisum sativum*) mosaic, though previously found (E. S. R., 54, p. 248) to be widely distributed in Wisconsin, appears to cause little injury to early varieties. Sweet peas, which are severely damaged, show in connection with the usual mosaic symptoms more leaf mottling, dwarfing, and distortion. Mosaics in both garden pea and sweet pea are intertransmissible by the pea aphid and by artificial inoculation.

Red clover mosaic has been transmitted to the garden pea and sweet pea by artificial inoculations and to the garden pea by aphids. Inoculations by means of aphids have indicated that red clover is susceptible to the mosaic occurring on these two hosts. Since red clover is a perennial on which the pea aphid is said to overwinter, it is considered probable that aphids migrating from clover to peas in spring carry the disease, introducing the mosaic into the fields.

No evidence of seed transmission of the disease was found in more than 1,900 plants grown from seed of mosaic garden and field peas. Cross-inoculations to garden and sweet peas from mosaic bean and sweet clover have yielded only negative results.

An unusual vascular browning of potato tubers as a result of frost, J. W. EASTHAM (*Phytopathology*, 15 (1925), No. 11, p. 731).—As the result of frost late in September, Burbank potatoes showed a vascular browning and phloem necrosis. Unlike typical frost necrosis, this was confined to the vascular rings, thus rather imitating wilt. Field observations also suggest that a succession of temperatures near freezing but not low enough to kill the tops may bring about net necrosis of the tubers in the Burbank variety. A case of black heart was also observed in potatoes which had been exposed to freezing, about 12 per cent being so badly frozen that they collapsed. After sorting and sacking, the remainder were stored under good ventilation without heating, and about 8 per cent developed black heart. Potatoes of the same variety not exposed to freezing, but stored under identical conditions, developed no black heart.

Report on experiments with *Cajanus indicus* (rahar) for resistance to *Fusarium vasinfectum* (wilt disease), W. McRAE and F. J. F. SHAW (*Agr. Research Inst., Pusa, Sci. Rpts. 1925-26, pp. 208-212, fig. 1*).—Tests including selection, reseeding, and exposure to wilt-infected material suggest that at least a slight increase of resistance can be produced at once by this means.

Attenuation of the virus of sugar beet curly-top, E. CARISNER (*Phytopathology*, 15 (1925), No. 12, pp. 745-757, pls. 5).—It is said to have been previously reported (E. S. R., 52, p. 149) that by the passage of the virus of sugar beet curly top through nettle-leaved goosefoot (*Oenopodium murale*) the virus is so attenuated that when transmitted to healthy young sugar beets it either fails to cause curly top or produces mild cases only. *C. murale*, *Rumex crispus*, and *Suaeda moquini*, found to be very resistant to curly-top virus, are

being studied in regard to their effect on the virus, and it has been found that in passing through these plants the virus becomes so attenuated that it causes merely a mild curly top when transferred to healthy beets or other susceptible plants.

"The attenuated virus has been found to occur in beet leafhoppers when collected from their natural breeding areas, and it has been assumed that the attenuation in these cases had resulted from the passage of the virus through resistant plants, of which the three species before mentioned are probably only representatives."

Disinfection and stimulation studies with sugar beet seed and wheat [trans. title], M. PLAUT (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 36 (1926), No. 11-12, pp. 321-351, figs. 9).—On the basis of the figures here set forth as the result of recent work, the author advises against the view tentatively expressed by him in a previous account (E. S. R., 53, p. 247), so far as beet seed treatments are concerned. Neither dry treatment nor application of formalin vapor gave an increase as regards either growth or sugar production.

Leaf-scald: A bacterial disease of sugar cane, D. S. NORTH (*Colon. Sugar Refining Co. [Sydney] Agr. Rpt. 8* (1926), pp. 80, pls. 2, figs. 25).—This publication gives introductively an account of apparent differences between the Java gum disease and the Australian leaf scald, with an outline of the type, history, dissemination, distribution, varieties affected, symptoms, and losses in the diseases, which are considered as essentially identical, the few minor differences which appear seeming insufficient to establish a valid distinction. Wilbrink's comparisons (E. S. R., 45, p. 146) are considered to show that sereh is distinct from gum disease, the distinctions applying equally to leaf scald. Leaf scald is considered as a disease of the vascular system, closely resembling Cobb's gumming disease (*Bacterium vasculorum*), though really distinct from it, the two organisms differing in size and cultural characters, also in field symptoms. The yellowish color and viscid slime production associated with gumming are absent in leaf scald. That leaf scald was introduced to Australia before 1900, and to Fiji somewhat later, is indicated by the history of Mahona, a New Guinea cane variety valuable commercially except for its susceptibility to this disease.

Leaf scald may occur either in the form of an acute and sudden wilt or in the chronic form producing dwarfed stalks with chlorotic leaves and numerous side shoots, these two forms being for some years regarded as distinct diseases. The characteristic diagnostic symptoms are borne only by cane shoots affected with the chronic form, the most important being fine whitish streaks on the leaves following the course of the vascular bundles. Numerous side shoots and small suckers are also produced, and white chlorotic leaves appear in the advanced stages. Both stalks and leaves are stunted, the leaves being stiff and tending to curl upward. Reddened vascular bundles occur in the stem tissues, particularly at the nodes, and dried-up cavities may be found in advanced stages.

Inoculation tests with pure cultures proved that the accompanying organism causes the disease. Inoculation of matured leaf blades, leaf sheaths, and stem tissues of growing plants had a transitory effect, if any, and root inoculation was unsuccessful. It is thought some of the methods may succeed if a year or more be allowed for the disease to develop.

Dissemination takes place in field practice by use of infected planting material, by knife infection, and probably by some other means at present unknown.

The inversion activity of the enzyme from *Leuconostoc mesenteroides* [trans. title], A. G. ARKHIPOVICH and V. E. IVANOV (*Zapiski*, 4 (1926), No. 1,

pp. 31-37).—The presence of *L. mesenteroides* in the process of the sugar industry favors the production of reducing substances. Its enzyme is active under acid, neutral, or alkaline reactions. Apparently a water extract of the mycellum contains a series of complex ferments. The speed of the reaction caused by the ferments does not agree with any of the physicochemical mathematical formulas for the reaction velocities. The course of the reaction could not be expressed either by a formula of a linear or of a logarithmic function. The organism is very resistant to high temperatures and is very detrimental to the processes of sugar production.

Effect of mosaic on sweet potato yields, H. H. WEDGORTH (*Miss. State Plant Bd. Quart. Bul.*, 6 (1926), No. 3, pp. 11, 12).—A preliminary experiment carried on during the summer of 1926 at the Mississippi Experiment Station showed the average yield of roots 0.5 in. in diameter or larger of the mosaic plants to be only 38.9 per cent of that of healthy plants.

A tomato disease [trans. title], M. SIMONET (*Rev. Path. Vég. et Ent. Agr.*, 13 (1926), No. 1, pp. 70, 71, pls. 2).—A premature fruit drop of tomato was found to be associated with *Phoma destructiva*.

Biology and control of Cladosporium fulvum on Solanum lycopersicum [trans. title], E. HASPER (*Ztschr. Pflanzenkrank.*, 35 (1925), No. 3-4, pp. 112-118).—Control of *C. fulvum* on tomato in hothouses is secured by spraying the plants with 0.5 per cent Uspulun, thorough aeration of the building, treatment of the aboveground structure with 10 per cent phenol solution, sterilization of the soil with hot water or steam, and, if necessary, alternation with some other plant for a year.

Hyperplastic crushing of the tracheal tubes in mosaic tomato stems, M. W. GARDNER (*Phytopathology*, 15 (1925), No. 12, pp. 759-762, pls. 2).—Having studied the changes previously noted (E. S. R., 53, p. 753) as accompanying mosaic in tomato, the author states that the severe streak or winter-blight type of tomato mosaic is characterized by necrotic strips and pockets in all the tissues of the stems and petioles. This necrosis is frequently associated with hyperplasia or proliferation of the adjacent cells in the form of zones or cushions of muriform tissue pushing in against the necrotic tissue. "When necrotic planes occur near and parallel to the cambial region, the inwardly directed hyperplastic response is often so vigorous as to invade the xylem and flatten and crush the tracheal tubes."

Plant wilt-resistant tomatoes, D. C. NEAL (*Miss. State Plant Bd. Quart. Bul.*, 6 (1927), No. 4, pp. 14-18, figs. 3).—Wilt, frequently a limiting factor in tomato growing throughout Mississippi, where losses have averaged annually for years from 15 to 20 per cent of the crops, is largely preventable since the introduction of suitable wilt-resistant varieties. Marglobe, a second early variety, is resistant and very productive, having outyielded all others for two years in station tests. Marvana, an excellent, productive, first early variety, is quite resistant, but ripens too quickly to be a desirable shipper. Norton and Columbia, excellent red-fruited varieties, are wilt-resistant, good canners, and all-summer bearers.

Second report of progress on studies of crown gall in relation to nursery stock, A. J. RIKER and G. W. KEITT (*Phytopathology*, 15 (1925), No. 12, pp. 805, 806).—Studies subsequent to those previously noted (E. S. R., 54, p. 452) are said to have yielded results which are in full conformity with the working hypothesis that the malformations dealt with on these trees were not induced by the crown gall organism and that the development of such malformations was merely incidental to the root-grafting method employed. It is claimed that *Bacterium tumefaciens* was not a factor in the production of the over-

growths on the piece-root apple grafts, and that the occurrence and development of such malformations may be reduced by modifications in the grafting practice.

Another apple-tree anthracnose in the Pacific Northwest and a comparison with the well-known apple-tree anthracnose, S. M. ZELLER and L. CHILDS (*Phytopathology*, 15 (1925), No. 11, p. 728).—Observations and specimens of a perennial and consequently difficult apple tree canker show it to be present in the Hood River and Willamette Valleys of Oregon, the Wenatchee and Spokane districts of Washington, and the Okanogan district of British Columbia. The causal agent is a *Gloeosporium*, with morphological affinities close to those of the imperfect stage of *Glomerella oingulata*. A characteristic ripe rot is produced on apple fruit in storage or by inoculation.

Scab control studies [trans. title], A. OSTERWALDER (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 36 (1926), No. 3-4, pp. 79-97).—Apple and pear scab control studies during 1915-1925, as here summarized, show about the same degree of tree injury to result from the use of Bordeaux mixture as from Burgundy spray. Sulfur preparations were better, particularly lime sulfur. Little injury was done to apple trees by use of dilutions of 1:30 or 1:40. Pear trees were more sensitive, showing spot and dieback effects following the use of strengths ranging from 1:30 to 1:50, but the results were not serious from a strength of 1:80, which was effective against pear scab. Other preparations are discussed in connection with their effects.

The control of core break-down in pears, H. HARTMAN (*Phytopathology*, 15 (1925), No. 11, pp. 731).—In all the tests and observations made, only the fruit harvested after its best picking time showed core breakdown. The kind or duration of storage does not appear to be involved. The pressure tester described previously (E. S. R., 51, p. 839) again proved to be a reliable indicator of maturity in pears, and it appears to be the most effective weapon in control of core breakdown. This disease has generally been controlled and pears have developed good quality when picking has been done within the following ranges of pressure: Bartlett, 35 to 25 lbs.; Anjou, 24 to 19 lbs.; Comice, 20 to 18 lbs.; Winter Nelis, 28 to 24 lbs.; Willamette Valley Bosc, 30 to 27 lbs.; and Rogue River Bosc, 24 to 20 lbs.

A storage rot of peaches caused by a new species of *Choanephora*, E. D. EDDY (*Phytopathology*, 15 (1925), No. 10, pp. 607-610, fig. 1).—The work herein briefly discussed as done in 1919 dealt with a fungus which was isolated from decaying peaches on the New York market. This is claimed to be new, and is described under the name *C. persicaria*. It is said to be closely related to *C. cucurbitarum*.

Preliminary reports on transmission of dwarf of loganberry, S. M. ZELLER (*Phytopathology*, 15 (1925), No. 11, p. 732).—When aphids originally obtained from *Rosa rubiginosa* were allowed to feed on loganberry plants showing dwarf disease (E. S. R., 57, p. 849) and afterwards transferred to young healthy leaves of caged loganberry plants, slight to severe necrosis along the veins and margins of the leaves resulted within six days, and all growth subsequent to such appearance showed the usual field symptoms of dwarf. Aphids from healthy loganberry plants produced no such symptoms.

Raspberry diseases and control measures, G. G. ATWOOD (*N. Y. State Dept. Farms and Markets Circ.* 280 (1925), pp. 11, fig. 1).—In this circular statistics are given for certain New York counties and for the State as regards the years 1910 and 1920, showing in most cases and in totals a considerable decrease in acreage and yields which is attributed to diseases. The major portion of the shrinkage is attributed to mosaic within the red varieties, within which also cane blight is comparatively important. Nineteen red and four purple varieties are tabulated with indications as to their "apparent susceptibility" (rate at

which mosaic is contracted) and their "real susceptibility" (degree of injury). "The black raspberry diseases that are most important are anthracnose, orange rust, cane-blight, streak (rosette or eastern blue-stem), and wilt (western blue-stem)."

Spur blight (*Mycosphaerella rubina*) of raspberry in Oregon, S. M. ZELLER and R. K. NORRIS (*Phytopathology*, 15 (1925), No. 11, p. 728).—Raspberry spur blight (*M. rubina*) is widely distributed west of the Cascade Mountains wherever *Rubus* spp. grow under favoring climatic conditions, black raspberry being less seriously injured than red raspberry and loganberry. The greatest loss (50 per cent) locally is done to Cuthbert under Ashland district climatic conditions. Satisfactory control, with increased vine vigor, is obtained by using Bordeaux mixture when the new canes are about 8 in. high and again when they are from 15 to 30 in. high.

An obscure new disease of the strawberry in California, A. G. PLAKIDAS (*Phytopathology*, 15 (1925), No. 11, p. 730).—A strawberry yellowing, curling, and dwarfing in the central California coastal region, especially in the Watsonville district, said to have been first described as a specific disease by Horne in 1922 (*El. S. R.*, 48, p. 541) and to have spread by the time of this report to Fresno, San Joaquin, Monterey, Sonoma, and Shasta Counties, is described as showing many characteristics of mosaic or degeneration disease. Preliminary experiments to transmit by inarching gave inconclusive results. Insects are suspected as carriers, in particular the red spider (*Tetranychus telarius*) and the strawberry aphid (*Myzus fragaefolii*).

Strawberry leaf-spot and its control, D. C. NEAL (*Miss. State Plant Bd. Quart. Bul.*, 6 (1927), No. 4, pp. 23, 24, fig. 1).—Strawberry leaf spot (*Mycosphaerella fragariae*) is described as observed for some years in Mississippi. It is controlled by application of a 4-5-50 Bordeaux mixture when the leaves are half grown and at intervals of from 10 to 14 days thereafter.

A rot of the Calimyrna fig in California, P. D. CALDIS (*Phytopathology*, 15 (1925), No. 11, p. 728).—A Calimyrna fig rot first observed in 1922, known as soft rot, pluk rot, brown rot, stem-end, or eye-end rot and also confused with souring, is said to be due to a form of *Fusarium moniliforme* and to occur only in caprifigged figs and caprifigs, being carried by *Blutophaga psenes*. A red and a white bacterium are constantly associated with the fungus, but are not primarily causal.

The avocado scab organism, A. A. JENKINS (*Phytopathology*, 15 (1925), No. 12, p. 807).—Repeated artificial field inoculations on avocado with the citrus scab organism have failed to show infection, though similar inoculations on avocado with the fungus associated with avocado scab have reproduced the disease in all cases. A critical study of the fungus from avocado is said to indicate that this is an undescribed species of the form-genus *Sphaceloma*.

Ecuador cacao succumbing to pests, J. B. RORER (*Tea and Coffee Trade Jour.*, 49 (1925), No. 6, pp. 919-921).—A condensed account, with some statistics, shows a decline in cacao production during recent years, with information regarding the appearance and progress of Monilla and the outbreak and spread of witch-broom disease due to *Marasmius perniciosus*.

Citrus canker scouting report for the period January 1, 1926, to December 31, 1926 (*Miss. State Plant Bd. Quart. Bul.*, 6 (1927), No. 4, p. 28).—Of the total of 180 properties found infected since June 1, 1916, none have shown infection since 1922, and these properties are regarded as no longer danger centers.

Diseases of the coconut palm, A. SHARPLES (*Malayan Agr. Jour.*, 14 (1926), Nos. 3, pp. 65-73; 4, pp. 91-95).—The first section of this account deals mainly

with coconut palm bud rot, being extracted largely from the article by McRae, previously noted (E. S. R., 50, p. 552).

The second part makes use of Nowell's account (E. S. R., 46, p. 454) of the red-ring disease of coconut palms, and states that experimentation carried out in the West Indies proved conclusively that the infestation of coconut palms by nematodes is the primary cause of the symptoms described. It is stated that sometimes an abnormal shedding of nuts first announces the presence of the nematode disease. In the final stage a bud bacterial soft rot occurs, but this has no relation to the infectious bud rot disease. The internal symptoms are a discolored dull red, or red mingled with mustard yellow. The discolored portion is seldom central, the diseased zone usually inclosing cylindrically the healthy central portion. To date the disease in Malaya has been found only in trees over 10 years of age. Abnormal lignification in the stem tissues is notable. The disease has been reported from practically every coconut-growing district in Malaya.

The relations of *Puccinlopsis caricae* to papaya (*Carica papaya*) in Florida [trans. title], J. C. T. UPHOF (*Ztschr. Pflanzenkrankh.*, 35 (1925), No. 3-4, pp. 118-122, figs. 2).—A brief study with references is presented of *P. caricae* on the under sides of leaves of susceptible individual plants of papaya in Florida.

Bunchy top disease of plantains: A review, C. H. GADD (*Trop. Agr. [Ceylon]*, 66 (1926), No. 1, pp. 3-9).—A review of the plantain bunchy top situation, experience, and observation centers suspicion on certain animal organisms which may cause or carry the disease, among these chiefly aphids and nematodes.

Incidence of bunchy top disease of plantains in Ceylon (*Trop. Agr. [Ceylon]*, 66 (1926), No. 1, pp. 9-12).—Reports recently received as to the incidence of banana bunchy top throughout Ceylon are arranged under divisions and districts to cover the territory and furnish concise information.

Bunchy top in bananas: Cause and nature of disease (*Trop. Agr. [Ceylon]*, 66 (1926), No. 1, pp. 12-20).—The bunchy top investigation committee, consisting of E. J. Goddard, C. J. P. Magee, and H. Collard, presents its report, with recommendations, to the bunchy top control board. It is claimed to have been definitely proved to the committee early in 1926, as previously noted (E. S. R., 56, p. 354), that bunchy banana top is a disease transmitted by the common dark banana aphid *Pentalonia nigronervosa*. While the ultimate nature and cause are unknown, the trouble appears to belong in the general class known as virus diseases. Sap inoculation experiments have not thus far succeeded. Recommendations are offered.

Plantains and bunchy top, T. H. HOLLAND (*Trop. Agr. [Ceylon]*, 56 (1926), No. 2, p. 125).—In November, 1923, a small experiment was started to test a preventive treatment against bunchy top. The suckers used were taken from trees apparently healthy, in an area in which bunchy top had occurred.

Soil treatments employing lime and concentrated superphosphate, or these with sulfur, showed no effect, as bunchy top appeared in 6 of the 10 varieties used.

In February, 1925, the treatment was repeated, and the same varieties were used to replant in the same rows, the suckers used being taken from supposedly healthy plants in the same plat. No bunchy top appeared in the whole area up to the time when the plants had long passed the stage at which that disease is contracted. Suckers from these plants were to be tested in their turn.

Antagonism of the walnuts (*Juglans nigra* L. and *J. cinerea* L.) in certain plant associations, A. B. MASSEY (*Phytopathology*, 15 (1925), No. 12, pp. 773-784, figs. 5).—Walnut (*J. nigra* and *J. cinerea*) is shown to cause a

wilt and dying of certain plants such as alfalfa, tomato, and potato. Roots of the affected plants were always in close connection with walnut roots, near which the toxic substance was localized. Walnut root bark contains a substance which is toxic to the roots of tomato plants grown in water culture. It appears likely that juglone, or some similar substance, is the toxic constituent.

Wilts of summer aster [trans. title], T. GANTE (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 3-4, pp. 72-79, fig. 1).—A study is reported as made on wilt or wilts of Chinese aster (*Callistephus chinensis*). Regarding the statement said to have been made by Wollenweber in Sorauer's handbook (E. S. R., 55, p. 242), as to the presence, though without proof of pathogenicity, in summer aster of *Fusarium flavum*, *F. dimerum*, *F. orthoceras*, *F. conglutinans*, *F. polymorphum*, *F. culmorum*, *F. graminum*, and *F. pyrochroum*, the present author was able to confirm the presence of *F. graminum*, *F. polymorphum*, and *F. culmorum*. An account of infection trials is detailed.

Attack on red beech and Canadian poplar by *Micrococcus ulmi* [trans. title], A. BRUSSOFF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 11-12, pp. 351-355).—Woods of both *Fagus silvatica* and *Populus canadensis* show, microscopically as well as macroscopically, essentially the same features as do elm, linden, and silver maple when attacked by *M. ulmi*.

Mistletoe in the lower bole of incense cedar, W. W. WAGENER (*Phytopathology*, 15 (1925), No. 10, pp. 614-616).—Noting reports by Meinecke (E. S. R., 27, p. 855) of true (wholly internal) parasitism by the incense cedar mistletoe (*Phoradendron libocedri*) as agreeing or contrasting with cases of perennial parasitism by *Gymnosporangium blasdaleanum* reported by Boyce (E. S. R., 40, p. 345), the present author describes a trunk swelling of incense cedar, extending in height from 2 to 10.5 ft. above the ground in a tree of 50 in. diameter at stump height, which was associated with the presence of *P. libocedri*. The tree was about 448 years old, and had been attacked at least 409 years before the time of the present study. Though little harm appears to be done to the life of the tree, its market value may be seriously reduced.

A Tubercularia canker of Chinese elm, C. E. OWENS (*Phytopathology*, 15 (1925), No. 11, p. 729).—In May, 1925, a canker of the Chinese elm was studied, and in this canker a fungus was found to be producing freely the conidial stage of a species of *Tubercularia* which appeared to be identical with the imperfect stage of *Nectria cinnabarina*. Though in the cases observed the fungus appeared to have entered at pruning wounds, it appears to act after the entrance as a virulent parasite, killing trees apparently otherwise healthy and vigorous.

A new disease of white fir [trans. title], VON TUBEUF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 1-2, pp. 1-6, figs. 2).—About the middle of June, 1925, was observed for the first time a variegation of the foliage of white fir, the cause of which was not ascertained.

White pine blister rust in New York, H. H. YORK (*N. Y. State Col. Forestry, Syracuse Univ., Forest Protect. Conf. Papers*, 1926, pp. 4-10).—This account summarizes the history of white pine blister rust subsequent to its discovery on cultivated black currants at Geneva in 1906 and its discovery on white pine in 1909, with a summary of the more important results and bearings of efforts to study and control the disease.

White pine blister rust spreads by waves of infection. Large waves occurred in New York in 1911, 1913, 1916, and 1919, and (possibly) 1924, the 1919 wave producing at least 65 per cent of all the infection found in a number of places. Weather conditions are significant, especially moisture and temperature.

The crew method is effective and is economically practical, controlling blister rust adequately on a large scale. The average acre cost of protecting white pine from blister rust in New York on privately owned land in 1925 was 88

cts. The initial cost of protecting plantations averages nearly 35 cts. per acre. Protection does not make the cost of establishing a plantation of white pine prohibitive. Reappearance of currant and gooseberry bushes after eradication campaigns are almost invariably due solely to oversight by the workers. Reeradication by the scouting crew method is rarely necessary. Usually, such places as fence rows, stone piles, breaks, and swales should be scouted about every five years to insure complete blister-rust protection, but one man can ordinarily do this work.

Peridermium harknessi Moore in western yellow pine tops, L. S. GILL (*Phytopathology*, 15 (1925), No. 10, p. 617).—*P. harknessi*, which annually attacks seedlings and saplings most seriously, seldom working above the lower branches of the larger trees, was found in 1924 on the Stanislaus National Forest, California, at 5,000 ft. elevation, producing galls in the tops of several western pines 100 ft. in height and a number of the galls ranging above 75 ft. The alignment of the pines affected more or less agreed with the direction of the prevailing winds. The absence of uredinia may have been due to the excessive drought of that year.

Blister rust of Weymouth pine [trans. title], VON TUBEUF (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 36 (1926), No. 5-6, pp. 143-146).—A discussion of susceptibility in pines to blister rust records the observation that the lilac-colored superparasite *Tuberculina maxima* hastens the dying out of the blister-rust colonies, and may completely exterminate the blister-rust fungus.

The effect of fern and other growth on the health and growth of the rubber tree, F. G. SPRING (*Malayan Agr. Jour.*, 14 (1926), No. 5, pp. 119-124).—Inspection of seven rubber estates showed on one only of these a case of probable injury caused by the growth of ferns to the rubber trees. The small amount of the noxious plant lallang may or may not have been an influential factor.

Hevea mildew in Ceylon and Malaya, A. SHAPLES (*Malayan Agr. Jour.*, 14 (1926), No. 4, pp. 88-90).—The account given by Gadd (*E. S. R.*, 57, p. 852) of *Hevea* young leaf-cast disease outbreak in Ceylon is said by the present author to describe in a fairly typical way, though with some differences, the Malayan experience of that year. However, *Oidium* was absent, the prominent fungus being a *Gloeosporium*, presumably *G. alborubrum*. The hyphae typical of *Phytophthora* causing a leaf cast were not demonstrated. The attacked portions of the leaves blackened, but there was no sign of the surface mildew which is said to be the prominent feature in Ceylon. In Malaya, a long dry period in December started wintering two months earlier than is usual, and rains caused a very uneven wintering. Flushes of new leaves were followed by heavy leaf falls, complete defoliation resulting on three occasions. The year 1926 was normal to date (April), and no leaf fall had been reported. It is thought that under dry-weather conditions at the time when new leaves appear no serious leaf fall is to be expected.

"Sun-scorch" of exposed lateral roots of *Hevea brasiliensis*, A. SHAPLES (*Malayan Agr. Jour.*, 14 (1926), No. 5, pp. 116-118).—The dry period referred to above continued favorable so far as *Hevea* leaf-fall causation was concerned, but a sun scorch of lateral roots occurred, first noticed on hillsides where exposure of the roots was considerable. Slight bark cracks corresponded to wood discoloration below, which was typical of attack by the *Diplodia* which causes *Hevea* branch die-back, and which was progressing slowly along the wood. Lightning injury was precluded in these cases.

Inoculation experiments in relation to "sun-scorch" on exposed lateral roots of *Hevea brasiliensis*, F. S. WARD (*Malayan Agr. Jour.*, 14 (1926), No.

9, pp. 286-289).—Inoculation and heating experiments carried out to ascertain whether sun-scorching or *Diplodia* was the real cause of the root injury referred to by Sharples (see above), indicate that the *Diplodia* sp. usually found associated with such injuries of *H. brasiliensis* as "lightning strike," die-back, or sun scorch of exposed lateral roots is not an ordinary wound parasite, as is frequently assumed, but that it is rather a special type of wound parasite which under certain conditions (allowing for sufficient heating of localized areas of cortical tissue) results in strong infection and rapid progress by the fungus. There was suggested, also, an explanation of the occurrence of die-back in Malayan plantations after wintering, which is important in Malaya; but tests of 105 *H. brasiliensis* die-back branches showed no *Diplodia* to be present in 72 cases and *Diplodia* present with other fungi or insects in 22.

Treatment on "wet-root rot" in Malaya caused by *Fomes pseudoferreus*, A. SHARPLES (*Malayan Agr. Jour.*, 14 (1926), No. 2, pp. 32-36).—Hevea wet root rot, regarded by some planters as a limiting factor in plantation longevity, is described as to its progress from tree to tree by root contact. No mature fructifications of the fungus, *F. pseudoferreus*, have been found in Malaya, so that the spread of the organism by spore dispersal is probably not important.

The method which has been in general use, trenching so as to include both the infected trees and the near-by or intermingled trees not yet visibly affected of a group, has been experimentally modified by marking the obviously diseased trees, destroying at once the badly diseased trees, and examining the neighboring trees by following their roots to their distal extremities, often from 20 to 30 ft. from the trunk. If disease was found, the opening up work was continued until healthy trees were found in all directions. Excision of the roots found to be affected prevented the disease from traveling back into the trunks, thus saving valuable trees already infected. The disease was found to be confined to lateral roots growing in the upper 9 in. of soil.

It was found that for a total of 212 badly diseased trees cut out, 185 could be treated by severance of diseased lateral roots, and that 356 trees within this area found healthy could presumably be saved by this method. The cost was slightly less than \$3 per tree. Of trees the roots of which were severely cut on account of the nearness of infection to the trunk, few showed evidence of the severe treatment, and on later inspection these looked healthier than they did at the time of treatment.

It is stated that the conclusions regarding wet rot do not apply to the dry rot of Hevea caused by *Ustulina zonata*.

Annual report of mycologist for 1925, A. SHARPLES (*Malayan Agr. Jour.*, 14 (1926), No. 6, pp. 160-164).—Like the previous report (E. S. R., 56, p. 541), this deals in some detail with diseases of the rubber tree (*Hevea brasiliensis*). A mold due to heedless tapping shows a *Fusarium* and a *Cephalosporium*. A study of patch canker has shown that this disease in Malaya may be due to a fungus deviating from the genus *Phytophthora* and more closely related to *Pythium*. Moldy rot, which has been thought to be due to *Sphaeronema fimbriatum*, is probably due to *Ceratostomella fimbriata*. New infection centers have been reported. Brown bast treatment by the Keuchenius method of isolation by deep cuts has been only partly successful in Malaya. The root disease (*Fomes pseudoferreus*) and secondary leaf fall have been dealt with above.

Palm diseases studied remain obscure as to causation. Sirih was shown to be due to a *Phytophthora*. Coffee bush preliminary spraying trials indicate that good results may be expected from Bordeaux mixture or Agrisol (2 per cent). A tuber disease of Jerusalem artichokes due to *Sclerotium rolfsii* was

not prevented by any measure tried. A physiological bursting of cortex of young branches of *Aleurites triloba* and later boring beetles favored the entrance of fungi of the Diplodia type, but Bordeaux mixture (6-6-50) controlled the trouble. Attempts were made to control by means of fungus disease the spread of the wild blackberry (*Rubus fruticosus*). Three species of fungi have been isolated from diseased specimens. Work with respect to fungi causing decay in fabric materials showed that of 51 type samples of cloth exposed many were badly attacked by microorganisms. Inspection work by S. C. Harland and O. A. Reinking showed that specimens of banana obtained from Siam were infected by *Fusarium cubense*, the cause of the Panama disease.

Decay in relation to the length of rotation, H. SCHMITZ (*N. Y. State Col. Forestry, Syracuse Univ., Forest Protect. Conf. Papers, 1926, pp. 14-30*).—Reviewing some of the more carefully collected data on forest decay, the author attempts, largely through his own interpretations, to show how and how far such data (as here treated) may be used to indicate the relation between decay and rotation, the trees studied including Douglas fir, incense cedar, western hemlock, western white pine, and aspen. All of the studies referred to (except possibly aspen in Minnesota) were made in natural, virgin stands, and it is thought they may not be fully applicable to future stands handled under more or less intensive forestry management.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Noxious and beneficial animals affecting cultivated plants in west Poland in the years 1924 and 1925 [trans. title], S. KÉLER (*Prace Wpłd. Chorób Roślin Państ. Inst. Nauk. Rolnicz. Bydgoszczy, No. 2 (1927), pp. 47, pl. 1; Eng. abs., p. [47]*).—This is a general account of observations of invertebrates of economic importance, particularly insects.

Jack rabbits of eastern Colorado (*Colo. State Ent. Circ. 52 (1926), pp. 18, figs. 4*).—The first part of this circular (pp. 3-9), which is by W. L. Burnett, reports upon studies of the life history of jack rabbits in eastern Colorado, including the white-tail jack rabbit, *Lepus townsendii campianus* (Hollister), and the black-tail jack rabbit, *L. californicus melanotis* (Mearns). Part 2 (pp. 9-12), by S. C. McCampbell, consists of notes on some parasites of the jack rabbits in eastern Colorado, and in part 3 (pp. 13-18) W. L. Burnett discusses methods of poisoning jack rabbits.

Bird parasites of the nematode suborders Strongylata, Ascaridata, and Spirurata, E. B. CRAM (*U. S. Natl. Mus. Bul. 140 (1927), pp. XVII+465, figs. 444*).—In this work an attempt is made to assemble descriptions of the species of nematodes of the suborders of Strongylata, Ascaridata, and Spirurata, exclusive of the Filarioidea, found in birds. Approximately 50 genera, containing about 500 species, are dealt with. Keys are given for the separation of all these groups from species up to orders. The author has erected several new families and superfamilies. Seven species are described as new, several species are redescribed, and new names are given to two previously described species. A host list (pp. 393-419) and a bibliography (pp. 419-435) are appended.

Revised key and list of the amphibians and reptiles of North Carolina, C. S. BRIMLEY (*Jour. Elisha Mitchell Sci. Soc., 42 (1926), No. 1-2, pp. 75-93*).—Keys are given for the identification of salamanders, frogs and toads, crocodiles, lizards, snakes, and turtles.

General entomology, T. D. URBANS and H. C. LEWIS (*Calif. Dept. Agr. Mo. Bul., 15 (1926), No. 7-12, pp. 129-131*).—This is a discussion of the appearance of the more important pests of the year 1926 and the work conducted.

The State entomologist law and the pest law of Colorado (*Colo. State Ent. Circ. 50* (1926), pp. 15).—This compiles the laws as of February, 1926.

Fifty-seventh annual report of the Entomological Society of Ontario, 1926 (*Ent. Soc. Ontario, Ann. Rpt., 57* (1926), pp. 63, figs. 8).—The papers presented at this annual meeting of interest to economic entomologists include the following: A Study of *Balaninus obtusus* Blanchard, or a Life History in a Hazel Nutshell, by C. B. Hutchings (pp. 9-12); Mosquito Control at Ottawa, Ontario, by C. R. Twinn (pp. 12-17); Paradichlorobenzene as a Control for the Mushroom Mite [*Tyroglyphus lintneri* Osb.], by L. Caesar (pp. 17, 18); Notes upon the Insect Preparations Used in Class Work at the Oka Institute of Agriculture, by Father Leopold (pp. 19, 20); The Activities of the Division of Foreign Pests Suppression, by L. S. McLaine (pp. 20-22); Some Preliminary Observations on the Life History of the Armyworm, *Cirphis unipuncta* (Haw.), by H. F. Hudson and A. A. Wood (pp. 22-24); The Spread and Degree of Infestation of the European Corn Borer in Canada, 1926, by W. N. Keenan (pp. 24-27); The Occurrence of the European Corn Borer in Ontario in Plants Other Than Corn and Its Significance (pp. 28-32) and The Larval Mortality of the European Corn Borer in 1926, both by J. Marshall (pp. 33, 34); The European Corn Borer—the Outlook in Ontario, by L. Caesar (pp. 35-38); The Currant Fruit Fly, *Epechra canadensis* Loew, in Manitoba, Diptera, Trypetidae, by A. V. Mitchener (pp. 38-41); An Outbreak of the Turnip Aphid (*Aphis pseudobrassicæ* Davis), by L. Caesar (pp. 41-43); Some Notes on the Oviposition Habits of the Tarnished Plant Bug, *Lygus pratensis* Linn, with a List of Host Plants, by R. H. Painter (pp. 44-46); and The Entomological Record, 1926, by N. Criddle (pp. 47-62).

[**Papers on economic entomology**] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 24* (1927), pp. 40-148, figs. 7).—The several papers relating to entomology here presented are as follows: An Attack of Cockchafer Larvae on Grassland and Some Experiments in Connection with Their Control (pp. 40-43), Caterpillars and Plant Lice Attacking Chrysanthemums under Glass (pp. 44-50), and The Scarcity of Aphides in 1924 in Southern Britain (pp. 51-53), all by F. V. Theobald; A New Gall Midge Attacking *Arabis albidæ*, by H. F. Barnes and F. V. Theobald (pp. 54, 55); The Beet Eelworm (*Heterodera schachtii* (Schmidt)): Its Life History When Found on Hops in This Country (pp. 56-58), and The Blossom Beetle (*Meligethes aeneus*) Attacking the Seed Crop of Swedes, etc. (pp. 59-63), both by C. A. W. Duffield; Material for a Monograph of the British Cecidomyiidae or Gall Midges, I-V, British Gall Midges of Economic Importance, by H. F. Barnes (pp. 65-146); Papers by F. V. Theobald, 1923-1927 (p. 147); and Papers by H. F. Barnes, 1923-1926 (p. 148). The account of the British gall midges of economic importance deals with those attacking cereal crops, fodder crops, fruit, vegetables, and miscellaneous plants, under separate headings, and includes a 12-page list of references to the literature.

[**Contributions on economic insects**] (*Ztschr. Angew. Ent., 12* (1926), No. 2, pp. 223-384, figs. 62).—The papers here presented (E. S. R., 56, p. 856) include the following: An Elucidation of the Question of Thrips Injuries, by J. Jablonowski (pp. 223-242); Contributions to Experimental Parasitology.—I, On the Procedure in the Investigation of Swellings and Other Skin Phenomena Resulting from Insect Punctures, by A. Hase (pp. 243-297); The Importance of the Red Forest Ant [*Formica rufa* L.] to Forestry, by H. Eldmann (pp. 298-331); Fly and Mosquito Control, by W. von Schuckmann (pp. 332-339); Tea Pests in the Dutch East Indies and Their Control.—III, *Euphorus helopeltidis* Ferrière (Hym. Braconidae) as a Parasite of the Larvae of the

Tea Capsid, *Helopeltis antonii* Sign., by R. Menzel (pp. 340-356); *Curinus* (*Orcus*) *zonatus* Muls. (Coccinellidae), an Enemy of Coccids on Orange Trees: Contributions to Its Morphology, Biology, and Control, by J. Wille (pp. 357-375); On the Immunity of Some Caterpillars to Their Ichneumonid Parasites, by N. F. Meyer (pp. 376-384).

The cytology of natural parthenogenesis [trans. title], A. VANDEL (*Bul. Biol. France et Belg.*, 61 (1927), No. 2, pp. 93-125).—This discussion of the subject is dealt with in connection with a bibliography of eight pages.

Experiments on the resistance of *Dermestes coarctatus* Harold and *Tribolium ferrugineum* Fabricius to abnormally high temperatures, K. YOKOYAMA (*Bul. Imp. Seric. Expt. Sta., Japan*, 2 (1927), No. 3, pp. 103-117, pls. 3).—It was found that in raising the temperature there was not a single living adult of *D. coarctatus* at 58° C., and that the temperature between 56 and 58° was fatal to the adult. The resistance of the insect to dry heat was found to vary with the species, *T. ferrugineum* having a greater resistance than *D. coarctatus*. The resistance of the insect was found to vary also with the stages of its development, the pupa being the most susceptible to the dry heat, followed by the adult, with the larva the most resistant. Confinement for about 1 hour in 50° killed all stages of *D. coarctatus*. The male *D. coarctatus* is said to have a little more resistance than the female. In practical work, a temperature of about 50° kills all stages of sericultural insect pests if they are actually subjected to this temperature for 1 or 2 hours.

Remarks on the propriety of introducing insects to control prickly pear in Australia, T. H. JOHNSTON (*Roy. Soc. So. Aust. Trans. and Proc.*, 50 (1926), pp. 235-240).—This is a paper read August 12, 1926.

Handbook of citrus insect control for 1927, R. S. WOGLUM, J. R. LAFOLLETTE, and W. E. LANDON (*Calif. Fruit Growers Exch., Los Angeles, Bul.* 4 (1927), pp. 33, fig. 1).—The authors summarize scale control work with black scale (pp. 4-14), red scale (pp. 15-20), purple scale (pp. 21, 22), Citricola or gray scale (p. 22), citrus thrips (p. 23), citrus red spider (pp. 23-25), and citrus aphids (pp. 25, 26).

[Insect pests of tea in Ceylon], E. C. ELLIOTT and F. J. WHITEHEAD (*In Tea Planting in Ceylon. Colombo and London: Times of Ceylon Co., Ltd.*, 1926, pp. 110-116).—The authors briefly discuss the principal insect pests of tea in Ceylon, namely, the tea tortrix (*Homona coffearia*), shot-hole borer (*Xyleborus fornicatus*), five species of termites, and mosquito blight (*Helopeltis theivora*).

Forest insects and timber borers, W. W. FROGGATT (*Sydney: A. J. Kent*, 1927, pp. IV+107, pls. 31).—Some 50 insects of economic importance in the forests of Australia are here considered. A catalogue of the described species of the family Bostrychidae found in Australia is appended.

Records of forest noxious insects and their importance to biologist and practicalian [trans. title], S. KÉLER (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Rolnicz. Bydgoszczy*, No. 3 (1927), pp. 1-17, pls. 2; *Eng. abs.*, pp. 15-17).—This is a report of observations extending from the year 1887 to 1920.

The relation of insects to slash disposal (*U. S. Dept. Agr., Dept. Circ.* 411 (1927), pp. 12).—This is a summary of information prepared by entomologists and collaborators of the Division of Forest Insect Investigations, Bureau of Entomology, in which the outstanding conclusions reached to date are given.

It is pointed out that so far as is known pine, spruce, and Douglas fir are the only species of timber to which insects associated with slash are of any important economic significance. Comparatively few species of insects are capable of adapting themselves to breeding in slash and killing living trees. The great majority of the important tree-killing insects which attack slash breed largely

in the cull logs and butts, and the present methods of brush burning can have little influence on their control. Where logging operations are continuous, and a constant supply of slash is provided, the potential danger from insects need cause no concern. Slash attracts from the surrounding forests insects which often concentrate in standing timber in the vicinity of the cutting, and no method of slash disposal will avoid this effect. In special cases where the value of the surrounding timber is greatly enhanced, extreme caution should be exercised in felling green timber. In such cases the attraction of the felled timber for insects is more important than its service as a breeding ground, and all such work should be done in the fall or winter, at least two months before the growing season. A large number of insects of secondary importance breed in the twigs, limbs, and trunks of fallen trees, and sometimes become so numerous as to kill reproduction, pole stands, and occasionally even mature trees in the vicinity. Such outbreaks are, however, sporadic in nature and of short duration, and, under present economic conditions, do not warrant special methods of slash disposal.

Tea green fly (*Empoasca flavescens* Fabr.), E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, 1927, No. 2, pp. 61-68).—The author reports upon studies of the development of this leafhopper enemy of the tea bush, the details of which are given in tabular form.

The rhododendron bug (*Leptobyrsa (Stephanitis) rhododendri* Horv.) ([*Gt. Brit.*] *Min. Agr. and Fisheries, Leaflet 165* (1927), pp. 3, pl. 1).—A practical summary of information on this insect.

The Dictyospermum scale in California, *Chrysomphalus dictyospermi* (Morgan), E. L. SMITH (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 7, pp. 404, 405).—A rather complete survey of nurseries, made during the last year through the cooperation of horticultural commissioners, led to the addition of a few infestations. Of the total number found, half were in Los Angeles County, the only southern county affected.

Greenhouse white fly (*Aleurodes vaporariorum* Westd.) ([*Gt. Brit.*] *Min. Agr. and Fisheries, Leaflet 172* (1927), pp. 5, pl. 1).—A brief practical account of this pest and means for its control.

The felted beech coccus (*Cryptococcus fagi* Barensp.) ([*Gt. Brit.*] *Forestry Comn. Leaflet 15* (1926), pp. 4, fig. 1).—A brief account of an insect widely distributed throughout Great Britain, where it confines its attack to the beech.

The Maskell species of scale insects of the subfamily Asterolecaniinae, H. and E. MORRISON (*U. S. Natl. Mus. Proc.*, 71 (1927), Art. 17, pp. 67, pls. 29).—This is the third contribution to a study made of the collection of scale insects accumulated by W. M. Maskell of New Zealand during the years 1869 to 1897. The first two have been previously noted (*E. S. R.*, 47, p. 657; 49, p. 851).

Morphological and physiological studies of the respiratory system in Bombyx mori L.—On the closing apparatus of the spiracle, S. MORI (*Bul. Imp. Seric. Expt. Sta., Japan*, 2 (1927), No. 3, pp. 119-133, pls. 2, figs. 2).—This report of an anatomical study of the silkworm includes a list of 20 references to the literature.

The American moths of the genus Diatraea and allies, H. G. DYAR and C. HEINRICH (*U. S. Natl. Mus. Proc.*, 71 (1927), Art. 19, pp. 48, pls. 20).—In this contribution the authors treat 10 genera and 56 species, of which 5 genera and 12 species are described as new. The genus *Diatraea* includes several species that are of considerable economic importance because of their depredations upon sugar cane and Indian corn.

Oodling moth in the Grand Valley of Colorado, G. M. LIST and W. P. YETTER, JR. (*Colorado Sta. Bul.* 322 (1927), pp. 46, figs. 9).—This is a summary

of investigations of the codling moth in the Grand Valley of Colorado that began in 1914 and continued up to the time of writing, with the exception of the season of 1920. During the years 1915-1919 the work was in cooperation with the U. S. D. A. Bureau of Entomology, the results of life history studies for the years 1915 and 1916, by Siegler and Plank, having been published in Bulletin 932 (E. S. R., 45, p. 855) and the results of certain control experiments in 1916, 1917, and 1918 in Bulletin 959 (E. S. R., 46, p. 54) of the U. S. Department of Agriculture. The situation has constantly been growing more serious until at present the losses are very heavy and control measures are the most expensive of all the operations connected with production. The fruit in unsprayed orchards is usually a complete loss. In 1920 an orchard receiving six thorough sprays showed some 400 worms and 200 stings per 100 harvested apples. In 1923 another orchard receiving six sprays showed 505 worms and 756 stings per 100 harvested fruits. It is pointed out that stings are almost invariably caused by the feeding of larvae which later die from the effects of spray poisoning.

The biological studies are reported upon and illustrated by graphs. There are two complete generations and a partial third each year in the Grand Valley. The spring brood of moths began to emerge April 24 in 1925, but in 1922 emergence did not begin until May 13. The period of spring brood emergence varied in length from 39 to 49 days, the daily moth emergence for the seven seasons being shown in graph form. The earliest date of first brood emergence was June 21 in 1925 and 1926, while in 1915 the first emergence occurred July 9. The second brood moth emergence began as early as August 7 and continued until October 14, there being an overlapping in the emergence of first and second brood moths. The first generation complete life cycle in 1915 averaged 51.37 days with a minimum of 36 days, while in 1916 the average was 47.10 days with a minimum of 36 days. The average seasonal second generation life cycle varied from 42.4 days to 50.81 days, and the minimum cycles from 35 to 40 days. Fully 75 per cent of the first brood larvae transform to form a second generation, and some 8 to 10 per cent of the second give rise to a third generation, the individuals of which pass through only the egg and larval stages.

In control work, next reported upon, spraying with arsenate of lead has been found to be the most effective single means, dusting having given little control. The experimental tests and experience of growers has not proved conclusively the value of spreaders, of which the most promising are fish oil soap, linseed oil soap, and calcium caseinate, use of the last being the most convenient and economical. It was found that seven or eight should be the maximum number of applications, additional efforts giving best results when directed toward other means of control. The calyx application is the most effective single application. With the seven-spray schedule, three cover sprays are applied against the first brood and three against the second and third broods. In the eight-spray schedule, four cover sprays are applied against the first brood.

The use of cloth bands is said to be the most effective supplementary means of control. The trees should be well scraped and the bands be in place by June 5, being removed and all larvae and pupae killed each 10 days until September 1, and once after fruit harvest is complete. The importance of screening packing sheds and storage cellars before the spring brood of moths escapes is emphasized. The removal of all wormy fruit at thinning time is of material value, and the trapping of moths by means of baits has shown considerable promise. Of the large number of materials tested as ovicides the oils have proved most effective.

Under the conditions that exist in Grand Valley, it is said to be useless to attempt to protect a light crop of fruit, removal of the fruit before it becomes infested being more economical and greatly reducing the infestations. The pest is particularly free from natural enemies, although *Trichogramma minutum* Riley at times destroys many eggs. The same program of control that is recommended for the apple should be used on the pear. It is pointed out that codling moth shows indications of becoming a pest upon soft fruits, it having at times caused serious injury to plums, prunes, and apricots, and may attack the sweet cherry and peach.

A protozoan and a bacterial disease of *Ephestia kuehniella* Zell., G. F. WHITE (*Ent. Soc. Wash. Proc.*, 29 (1927), No. 6, pp. 147, 148).—The author refers briefly to a protozoan disease of the larvae of the Mediterranean flour moth, of which the causative sporozoan gains entrance to the host larvae with the food. Death is liable to result during the larval, pupal, or adult stage. The disease is said to incur heavy mortality in insect cultures.

A bacterial disease first observed by Berliner (E. S. R., 35, p. 253) in Germany in 1911 and its causative organism named by him *Bacillus thuringiensis* has been encountered in this insect in the laboratory of the U. S. D. A. Bureau of Entomology. Death from this organism usually takes place during the larval stage, the remains turning black and on drying becoming brittle. Thus far, the mortality in the insect cultures has been heaviest during the hotter periods of the summer, at which time it has reached 100 per cent.

A contribution to the study of hibernation in the larva of the European corn borer (*Pyrausta nubilalis* Hubn.), H. L. PARKER and W. R. THOMPSON (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, pp. 10–22, figs. 11).—This is a report of studies of the physiology of hibernation of *P. nubilalis*.

Some observations on the Swede midge in North Wales, C. L. WALTON (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 6, pp. 547–551).—This is a preliminary account of an attack by *Contarinia nasturtii* given chiefly to draw attention to the damage caused by this insect, which appears to have assumed unusual proportions and shown unusual symptoms during 1926.

New damage to peas by the pea midge, H. F. BARNES (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 2, pp. 159–161, pl. 1).—*Contarinia pisi* Winn. is reported to attack the flowers and shoots as well as the pods of peas. Attacked flowers may be distinguished by the swollen base of the sepals, which are of normal length, the petals being crinkled and shortened. The appearance is similar to that of flowers attacked by the pea thrips. There are two broods per year of the midges. The first attacks pea flowers, shoots, or pods, whichever are available at the time of emergence of the midges; the second brood attacks the pods. Soil fumigation is recommended as a means of control.

Rapid determination of Anopheles larvae in a new medium, J. ZETEK (*Amer. Jour. Trop. Med.*, 7 (1927), No. 4, pp. 247–249).—The author describes a new method for rapid identification of Anopheles larvae. A solution is made of Klim or any other milk powder, about the consistency of milk. This is put in the cavity of the culture slide almost to the level, and a larva is placed in the milk solution by means of a dropper. In this solution the larvae come to the surface and remain very quiet, and all that is seen are the palmate hairs, the antennae, and the moving mouth brushes. The palmate hairs stand out in bold relief against the white background, and in Anopheles suffice for identification. The distinguishing characters of the Anopheles larvae of the Canal Zone are pointed out.

Anopheles atropos Dyar and Knab: A note on its breeding and other habits, T. H. D. GRIFFITHS (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 29, pp.

1903-1905).—This is an account of the breeding and other habits of the salt water mosquito, *A. atropos*, which has been encountered in several areas in the States of Alabama, Mississippi, and Louisiana, occurring in marsh areas close to breeding places in such numbers as to be a menace.

Mosquito reduction and malarial prevention, J. A. CRAWFORD and B. S. CHALAM (London, New York, and Bombay: Oxford Univ. Press, 1926, pp. [XIII]+102, pls. 4, figs. 24).—The authors discuss the life history and habits of mosquitoes, their rôle in malarial transmission, and preventive work.

Investigation of Mexican fruit fly (*Anastrepha ludens* Loew) in Mexico, D. L. CRAWFORD (Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 8, pp. 422-445).—This is a report of studies of *A. ludens* made during the course of an investigation in 1913 and 1914 and deals with its distribution, host fruits, economic importance, symptoms and evidences of the pest, description, life history and habits, the generations of an entire year, dissemination, control by natural agencies, and artificial means, killing the maggots within the fruit, historical summary, and other Trypetidae in Mexico.

A serious pest threatens, A. C. FLEURY (Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 5, pp. 291-293, figs. 2).—This is a brief account of the Mexican fruit fly (*Anastrepha ludens*), which has been found attacking grapefruit in Hidalgo and Cameron Counties, Texas.

The Argentina fruit fly problem, F. E. TODD (Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 6, pp. 344-350, figs. 4).—A discussion of the status of the West Indian fruit fly in Argentina, based upon observations by the author during the year 1924-25.

The distribution of blow-flies in South Africa, with special reference to those species that attack sheep, B. SMIT and S. DU PLESSIS (Union So. Africa Dept. Agr. Bul. 13 (1927), pp. 19, figs. 3).—This paper reports upon data on the distribution of various species of blowflies over South Africa that have been collected during the past two years (pp. 3-9); sheep maggot flies (pp. 9, 10); distribution of *Chrysomya chloropyga*, *Lucilia sericata*, and *C. albiceps* over the farm of the Groofterfontein School of Agriculture (pp. 11-14), and their seasonal distribution in the Karoo as indicated by data collected at the School (pp. 14-17); and time of the year during which the flies attack sheep (pp. 17-19).

The cabbage maggot and its control in Nova Scotia, W. H. BRITAIN (Nova Scotia Dept. Nat. Resources Bul. 11 (1927), pp. 53, pls. 3, figs. 3).—This bulletin is said to summarize the results of 10 years' experimental work directed mainly toward the control of the cabbage maggot on early cabbage and cauliflower. Much of the data on life history is presented in tabular form.

As a remedy, the author recommends the watering of the plants with corrosive sublimate solution at the rate of about 0.4 pint per plant, using more if the soil is dry and hard and less if moist and loose. The first application should be made just after the first eggs are laid, or, if the plants are not set out until after egg laying has commenced, the first treatment should be given four days after the plants are set out. A second application should follow the first in seven days, and for safety some recommend a third application after a similar interval.

[Tenacity of the larvae of the cheese skipper, *Platiphila casei* L.], P. SIMMONS (Jour. Wash. Acad. Sci., 17 (1927), No. 15, pp. 403, 404).—A brief reference is made by the author to observations of the unusual resistance of the maggots of this dipteran to starvation, low and high temperature, and immersion in many liquids that are promptly fatal to most insects. An earlier account of this pest by the author has been noted (E. S. R., 56, p. 859).

The elm leaf beetle, D. B. MACKIE (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 5, pp. 294-301, figs. 4).—A discussion of this beetle, which has recently become firmly established in California and has spread with surprising rapidity. In 1924 it appeared in Fresno, and since its introduction it has spread over 30 miles to the east, 100 miles to the south, and over 50 miles in a northerly direction.

Another intermediary insect host of the giant thorn-headed worm of swine, *Phyllophaga vehemens* Horn (Scarabaeidae), new to the host list of this parasite, R. D. GLASGOW (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, p. 86).—*P. vehemens* was found to be an accepted host for the larval development of this parasite (E. S. R., 57, p. 63). In one instance 67 mature cysts of the giant thorn-headed worm were found in a single female adult of *P. vehemens*.

Another insect vector of the giant thorn-headed worm of swine, *Xyloryctes satyrus* Fabricius (Scarabaeidae), both genus and species new to the host list of this parasite, R. D. GLASGOW (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, pp. 127, 128, pl. 1).—The author has recently found *X. satyrus* to be a suitable host for the larval development of *Macracanthorhynchus hirudinaeus* (Pall.) Trav.

A preliminary account of the life-history of *Coccinella 11-punctata* (L.), O. A. M. HAWKES and T. F. MARRINER (*Ent. Soc. London, Trans.*, 75 (1927), pt. 1, pp. 47-52, pl. 1, figs. 2).—Notes are presented on observations of the biology of this lady beetle.

Notes on the biology of the meal worms, *Tenebrio molitor* Linne and *T. obscurus* Fab., R. T. COTTON (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, pp. 81-86).—The author briefly discusses the distribution and biology of the two species, which undoubtedly are cosmopolitan in distribution and probably occur in every section of the United States.

The dermestid beetles of New Jersey, including the carpet beetles and those which feed on animal products, A. J. MUTCHLER and H. B. WEISS (*N. J. Dept. Agr. Circ.* 108 (1927), pp. 31, figs. 33).—This account includes keys to the genera of Dermestidae and to New Jersey species of *Dermestes*, *Attagenus*, *Trogoderma*, *Cryptorhopalum*, and *Anthrenus*.

Disinfection of coffee seed attacked by the coffee berry beetle (*Stephanoderes hampei* Ferr.) [trans. title], J. G. J. A. MAAS and K. B. BOEDIJN (*Arch. Koffie Cult. Nederland. Indië*, 1 (1927), No. 6, pp. 233-248; *Eng. abs.*, p. 248; *abs. in Planters' Chron.*, 22 (1927), No. 21, p. 312).—A report upon experiments with air and water pressure, turpentine and formalin vapors, naphthaline, camphor, and formalin tablets.

The sweet-potato weevil (*Cylas formicarius* F.), C. P. VAN DER MERWE (*Union So. Africa Dept. Agr. Bul.* 14 (1927), pp. 10, figs. 4).—A practical account of this insect, which is present in the Union of South Africa all along the east coast wherever sweet potatoes are grown or other food plants are available.

The vegetable weevil in California, H. C. LEWIS (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 7, pp. 378-392, figs. 13).—An account is given of *Listroderes obliquus* Gyll., the so-called Australian tomato weevil, with references to the literature and studies of its life history in California, where it has become so firmly established that eradication is considered improbable. The pest was first discovered in California in February, 1926, on a truck farm near San Jose, where it was severely damaging truck crops, particularly carrots and spinach. Scouting has since been conducted, and its known distribution at the present time is limited to the San Francisco Bay region, infestations having been found at 13 different points.

Controlled mating of queenbees, L. R. WATSON (*Hamilton, Ill.: Amer. Bee Jour.*, 1927, pp. 50, pls. 10).—This report of the author's work, of which a preliminary account has been noted (E. S. R., 58, p. 62), deals with the subject under the headings of historical review of the problem of controlled mating of the queen bee, object of the present investigations, rearing and management of the queens used in these investigations, principal methods of attack used, procedure in instrumental insemination, and adaptations and limitations of instrumental insemination to the control of mating in honeybees. A bibliography of four pages is included.

Controlled mating of honeybees, I—III, L. R. WATSON (*Amer. Bee Jour.*, 67 (1927), Nos. 5, pp. 235, 236; 6, pp. 300–302, figs. 5; 7, pp. 364, 365).—The data here presented are included in the above account.

Tongue length and honey storing ability, R. HUTSON (*Amer. Bee Jour.*, 66 (1926), No. 8, p. 379).—The author reports upon measurements made of the tongues of 60 bees from each of 14 hives, by the use of a calibrated ocular micrometer fitted into a binocular microscope, after the tongues had been soaked 24 hours in 0.5 per cent sodium hydroxide. The results of the measurement of the tongues of 102 bees are tabulated, the data being arranged beside the ranking of the same hives in honey production and number of bees. The results failed to show any marked constant agreement between tongue length and honey stored. The agreement between number of bees and honey stored and number of bees in the hive is considered much more evident.

Report of the Dominion apiarist, C. B. GOODERHAM (*Canada Expt. Farms, Bee Div. Rpt.* 1926, pp. 18, figs. 6).—This is a general report of the work of the year, in which is included a discussion of honey production at Ottawa and the out-aplary, bees and pollination, queen breeding, wintering two queens in one colony, Carniolan v. Italian bees, egg-laying capacity of queens, package bees as a means of strengthening weak colonies in the spring, aluminum combs, hives, an experiment to determine the field force of the colony, inspection of honey, diseases, and wintering.

Forty-seventh annual report of the Beekeepers' Association of the Province of Ontario, 1926 (*Ontario Dept. Agr., Beekeepers' Assoc. Ann. Rpt.*, 47 (1926), pp. 120).—The papers here presented of interest to economic entomologists include the following: Unripe Honey—Grading Requirements, by W. A. Weir (pp. 16–22); Honey—Removing, Extracting, Straining, and Packing, by S. B. Bisbee (pp. 23–27); Roadside Selling, by J. F. Dunn (pp. 27–33); My Trip to European Beekeepers, by E. F. Phillips (pp. 33–47); My Reasons for Last Winter's Serious Loss, by N. Mitchell (pp. 47, 48), J. L. Byer (pp. 48, 49), and H. G. Sibbald (pp. 49, 50); The Swarming Problem, by G. S. Demuth (pp. 54–62); Experimental Work in Beekeeping by the Dominion Experimental Farm (pp. 66–70); Area Clean-Up in Peterborough and Adjoining Counties, by T. H. Shields (pp. 70–75); Report of the Provincial Apiarist for 1926 (pp. 75–78); Cereals and Honey, by M. I. Barber (pp. 78, 79); Experiments with Chemical Solutions, 1926, by G. L. Jarvis (pp. 79–81); The Place of the Amateur in Beekeeping, by E. F. Phillips (pp. 82–93); Modern Beekeeping, by G. S. Demuth (pp. 93–99); How a Study of the Occupants of the Hive May Increase Honey Yields, by C. B. Gooderham (pp. 99–105); Reducing Costs in Honey Production, by A. F. Hodgson (pp. 109–116); and Reducing Costs in Honey Production, by J. A. McKinnon (pp. 117–120).

The relation of temperature, light, and humidity to the behavior and longevity of a joint worm parasite (*Eurytoma* sp.), C. H. BRANNON (*Jour. Elisha Mitchell Sci. Soc.*, 42 (1926), No. 1–2, pp. 99–103, figs. 3).—This is a report of studies of an important parasite of *Harmolita tritici* which was kept in a cellar over a period of three months.

A note on the occurrence of the rat mite, *Liponyssus bacoti*, in South Australia, together with descriptions of certain stages, F. G. HOLDAWAY (*Royal Soc. So. Aust. Trans. and Proc.*, 50 (1926), pp. 85-88, fig. 1).—The author records the occurrence of the rat mite (*L. bacoti*) for the first time from South Australia. The egg and larval stages are described and notes given on the protonymph. The larva was found to molt without taking food.

ANIMAL PRODUCTION

Animal nutrition and veterinary dietetics, R. G. LINTON (*Edinburgh: W. Green & Son, 1927, pp. XII+399, pls. 5, figs. [15]*).—This treatise, designed for both the feeder and the veterinarian, deals with the composition and functions of foods, a description of the various feeds, the nutritive value of foods, their preparation and storage, the feeding of animals, and harmful foods and their effects.

Methods in feeding experiments, G. HAINES (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas.*, 1926, pp. 85-88).—A paper presented at the meeting of the American Society of Animal Production at Chicago, on November 26, 1926, criticizing methods and plans of feeding experiments (*E. S. R.*, 57, p. 763).

Studies of the influence of menhaden-fish meal on calcification in growing animals, L. A. MAYNARD and R. C. MILLER (*New York Cornell Stu. Mcm.* 108 (1927), pp. 23, figs. 3).—This study of the influence of menhaden fish meal on the calcification of bones in growing pigs (*E. S. R.*, 55, p. 864; 57, p. 461) and rats (*E. S. R.*, 57, p. 458), is a compilation of the work previously noted.

On the disintegration of rice straw, H. IWATA (*Jour. Dept. Agr., Kyushu Imp. Univ.*, 1 (1926), No. 6, pp. 217-240).—Experiments were undertaken at the Kyushu Imperial University, Japan, to determine the effect upon the composition and nutritive value of rice straw of boiling it in water and of disintegrating it with dilute alkaline solutions. Lots of 150 gm. of straw cut into 2- to 3-cm. lengths were placed in beakers and treated with water or alkaline solutions either by the cold or hot method. The cold method consisted of soaking in the various solutions for 4, 6, 8, or 24 hours, the liquid used in each case being equivalent to 8 times the weight of the straw. In the hot method 150 gm. of straw was mixed with 1,200 cc. of water or alkaline solution and boiled under a reflux condenser for 1.5 or 4 hours. The liquid was then drained and the straw washed with clean water until no alkaline reaction was obtained. Samples of the straw were submitted to tests for ash, silica, lignin, and the chlorine number.

The dry matter of rice straw has a starch value of about 20 per cent. Boiling the straw in water for 3 hours did not change the composition or nutritive value. Soaking in a 0.25 per cent solution of sodium hydroxide for 4 hours did not change the straw materially from the untreated state. Soaking in 0.75 or 1.5 per cent solution of sodium hydroxide for 4 hours, or boiling in a 1 per cent milk of lime solution for 3 hours, caused an extraction of a considerable quantity of incrusting substances, an increase in the digestible matter, and raised the starch value of the dry matter to from 53 to 58 per cent. As the lignin and chlorine decreased the starch value increased, but not proportionally.

What do range live stock eat? V. L. CORY (*Cattleman*, 14 (1927), No. 3, pp. 13-16, figs. 2).—Three years' observations were made on cattle, sheep, and goats at the Texas Ranch Experiment Station to determine the time of grazing and the preference for various kinds of forage present on that range. About two-thirds (67.6 per cent) of the total feeding of range stock at this station consisted of grazing. This total is divided into 33.03 for cattle, 27.49 for sheep,

and 7.08 per cent for goats. All these classes of livestock showed a decided preference for curly mesquite, which comprised over half of the grazing for each. Other forages used for grazing were winter annuals, other grasses, and weeds. The author describes and indicates the value of the various plants found on this range.

Cattle salting is important. W. R. CHAPLINE (*Cattleman*, 14 (1927), No. 3, pp. 17-19, 22, figs. 3).—The author discusses the problems of salting cattle on the yearlong ranges of the Southwest. He explains how the use of forage and the handling of animals may be facilitated by the proper placing of salt.

Lamb feeding experiment. [E. J. MAYNARD] (*Natl. Wool Grower*, 17 (1927), No. 4, pp. 22, 23).—Eleven pens of 25 lambs each were fed at the Colorado Experiment Station for 120 days, starting November 23, 1926, to compare panels and self-feeders for alfalfa hay; to determine the feeding value of cull beans; and to compare cottonseed meal and linseed meal, corn fodder and corn silage, and dried beet pulp, siloed beet pulp, and pressed beet pulp fed with shelled corn and alfalfa hay. Alfalfa hay was fed without cutting in self-feeders to all but one lot, in which it was fed through panels.

Self-feeding alfalfa hay proved more profitable from the standpoint of rate of gain and the amount of feed required to produce a unit of gain than feeding through panels, the average daily gain in the respective lots being 0.31 and 0.28 lbs. Cull beans alone caused somewhat slower gains, but required less feed per 100 lbs. gain and returned a 10-ct. greater profit per lamb than a combination of corn and cull beans. Lambs fed cottonseed meal in a ration of corn and dried pulp made 0.02 lb. greater daily gain per lamb, required less feed per unit of gain, and returned a profit of 33 cts. more per lamb than a lot on a similar ration in which the cottonseed meal was replaced with linseed meal. Corn fodder in this experiment proved to be more efficient than corn silage, the fodder-fed group returning the highest profit of any group in the experiment. The fodder used contained a considerable amount of corn, making this the heaviest fed lot in the test. Comparing pressed, siloed, and dried pulp, the average daily gains of the lambs in these lots were 0.317, 0.319, and 0.29 lbs., respectively. The cost of gains was greatest in the dried pulp lot and least in the pressed pulp lot. Pressed pulp returned a slightly greater profit than siloed pulp, and both returned a considerably greater profit than dried pulp.

The influence of herring meal on the quality of pork [trans. title], H. ISAACHSEN (*Meld. Norges Landbr. Høiskole*, 7 (1927), No. 7-8, pp. 525-552, fig. 1; *Eng. abs.*, pp. 548-552).—At the Institute of Animal Nutrition, Royal Agricultural College of Norway, 22 pigs were fed up to 220 lbs. in weight on a ration of mixed grains, milling offals with a little oil cake, and boiled potatoes, to which was added herring meal, poor in salt, with a 10 to 12 per cent fat content. The meal was gradually increased for all except 2 animals until they were receiving 0.66 lb. per head daily. Six pigs received herring meal from 1 month of age until 0.5 to 1.5 months before slaughter. The remaining animals received meal from 1.25 to 7 months, most of them up to the day of slaughter.

Carcasses were examined for taint due to herring meal as fresh, salted, and smoked pork, both boiled and roasted, and in 2 cases as canned pork. The cured meat was kept for periods up to 10 months. One hundred and forty-nine persons in all judged the meat and in no case found the taste of herring. A few considered the meat not quite fresh, and others thought that the consistency was somewhat soft. The iodine number was determined on the belly fat of 7 normal and 8 herring meal fed pigs. The mean in the former case was 62 and in the latter 64.

A chemical-physiological study of this problem shed no light on the fact that herring meal had little or no effect upon the fat of swine. The author believes

that an adequate explanation of the negative results obtained is because only part of the fat of herring meal is deposited as body fat and that in the ration fed the herring meal fat made up but a small part of the total fat of the feed. The work is being continued, using larger quantities of herring meal and also salt herring.

Care of the brood sow, W. W. SHAY (*N. C. Agr. Col. Ext. Circ. 151* (1925), pp. 11, figs. 3).—A discussion of the feeding and care of the brood sow before breeding, during gestation, at farrowing time, and during the nursing period.

Swine husbandry in central Alberta, F. H. REED and L. T. CHAPMAN (*Canada Dept. Agr. Bul. 73, n. ser.* (1927), pp. 32, figs. 8).—Brief accounts are given of experiments with swine dealing with self-feeding v. trough feeding for bacon production, inside v. outside feeding in winter, feeds for weaned pigs, effect of oat hulls on growth, common barley v. hullless barley, value of frosted wheat, minerals, purebreds v. crossbreds, and the value of pasture and pasture crops.

The influence of winter confinement of White Leghorn pullets on winter egg production, F. C. BOBBY (*Harper Adams Utility Poultry Jour.*, 12 (1926-27), No. 9, pp. 432-435).—Two pens of 200 White Leghorn pullets each were fed, housed, and managed under identical conditions for the five winter months beginning November 1, except that one group received green feed daily and was confined to the house at all times, while the other had access to grass runs. The egg production for the unconfined group was 20 per cent higher during this period than in the case of the confined pens. The food consumption was higher in the confined pens so that feed was not a limiting factor. In February and March 12 cases of leg weakness appeared in the confined pens, while the unconfined pens were entirely free from this condition. Post-mortem examination of birds from the two groups showed a greater number of cases of liver trouble among those birds which had been confined. Under the conditions of this experiment confining pullets during winter months was not profitable. However, the confined pullets never received direct sunlight, and this may have been the limiting factor in their production.

The use of artificial lights on White Leghorn pullets to increase winter egg production, A. E. TOMHAVE and C. W. MUMFORD (*Delaware Sta. Bul. 151* (1927), pp. 15, figs. 5).—Continuing this work, previously noted (*E. S. R.*, 56, p. 372), the results of three years' work are reported. Two pens of approximately 100 Single Comb White Leghorn pullets were used in each series of trials. The feeding and management were practically identical in each case except that one lot had its day lengthened by the use of artificial light in the morning. In trials 1 and 2 lights were turned on at 5 a. m., starting October 15. Each day thereafter the lights were turned on 10 minutes earlier until the lights were being turned on at 4 a. m., giving a 13- to 14-hour day. In the third trial the lights were turned on to give a 12.5-hour day. In trials 1 and 2 light was irradiated from a single 40-watt tungsten bulb without reflector, while in trial 3 two bulbs with reflectors were used. Mash and grain mixtures, grit, oyster shell, and water were available in all tests. Sprouted oats fed in test 1 and 2 was replaced with 15 per cent alfalfa leaf meal in trial 3. All tests lasted 151 days.

The total egg production was increased 25, 14.2, and 54 per cent, respectively, in these tests. In all cases the average value per dozen for the eggs was greatest in the lighted pens, as these birds laid more eggs during peak prices. The cost of producing eggs was less when artificial illumination was used. No detrimental effects were found from the use of illumination, in fact the pullets in the lighted lot in test 3 averaged 0.3 lb. more in weight per bird at the end

of the trial than those in the unlighted lot. Lights were of no value for stimulating production after March 1. Early hatched pullets subject to fall molt were safely carried over this period by the use of artificial light. The system of lighting used in test 3 was more satisfactory than in the other tests. In trial 3, 15 per cent alfalfa meal was satisfactory for replacing green feed.

Mash hoppers for poultry, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen*, 15 (1927), No. 12, pp. 4, figs. 4).—The desirable features of a good mash hopper, and the construction of three types of hoppers are described.

Turkey growing in Idaho, P. MOORE and M. R. LEWIS (*Idaho Agr. Col. Ext. Bul.* 67 (1927), pp. 36, figs. 10).—Popular directions for the breeding, management, feeding, and killing and dressing of turkeys. The more common diseases of turkeys are discussed. The construction of equipment necessary for turkey production is described and illustrated.

DAIRY FARMING—DAIRYING

Feeding the dairy cow, R. H. OLMSTEAD (*Penn. State Col. Ext. Circ.* 111 (1927), pp. 23).—The principles of feeding dairy cattle are discussed. Practical rations for use with various roughages are suggested. Appended are tables giving the composition of feeds and the comparative costs of digestible crude protein from different feeds.

A condensed method of computing balanced rations for dairy cows, D. J. ROBERTSON (*Wyo. Agr. Col. Ext. Circ.* 19 (1926), pp. 12).—By means of tables the computing of balanced rations for dairy cows is simplified.

Proved dairy sires, J. C. McDOWELL and W. E. WINTERMEYER (*U. S. Dept. Agr. Circ.* 3 (1927), pp. 8).—A review of the progress made in the proving of dairy sires by means of cow testing associations. It has been found that daughters of average sires in these associations produced 5.1 per cent more butterfat than their dams. The daughters of average proved sires produced 10.9 per cent more butterfat, and the daughters of average sires and average cows produced 67.6 per cent more than their dams. It is concluded that good proved sires should double the production of the average herd in two or three generations.

Testing cows for production every other month, J. C. McDOWELL (*U. S. Dept. Agr. Circ.* 1 (1927), pp. 4).—Testing 1 day every 2 months has been tried as a means of reducing the cost in small dairy herds. The yearly records of 70 cows at the Minnesota Experiment Station were used for checking this work. The average variation from actual production was 3.8 per cent. In 24 of the 70 cases the error was 5 per cent or more, but the greatest error was only 12.5 per cent. The average variation for the same records based on a 1-day per month test was 2.91 per cent, and the greatest error for the cow testing association method was 8.3 per cent.

The Bureau of Dairy Industry has also tried this method in Virginia in 1925-26, where it proved successful. It is expected that this method will have a place in districts where the herds are small.

The scoring of milk, J. C. BERRY (*Milk Dealer*, 17 (1927), No. 1, p. 138).—The author describes and discusses a score card for milk as used at the University of British Columbia.

Sterilization of milk by impact of steam, G. E. GRINDROD (*Creamery and Milk Plant Mo.*, 16 (1927), No. 9, pp. 38, 40, 42, 44, 46).—A general discussion of the steam impact principle of sterilization, including the theory of the process, the method of application, and its effect on various products and the results obtained by it on various milk products. Under proper conditions this new

method renders a mass of milk or cream completely sterile by exposure for one minute at 230° F.

Green colour in butter, A. A. RAMSAY, A. M. BROWN, and H. H. RANDELL (*Agr. Gaz. N. S. Wales*, 33 (1927), No. 6, pp. 475-480).—Investigations as to the cause of a greenish-gray color in butter were conducted by the dairy, chemistry, and biological branches of the Department of Agriculture, New South Wales. No definite correlation was found between the bacterial flora present and this condition of the butter, but other experiments showed that an aphid pest is intimately associated with the production of the green color. Pasteurization definitely accentuated the trouble. The abnormal color was not limited to the butter produced from the milk of cows suffering from dermatitis, but cows fed on feeds free or practically free from aphids did not produce off-colored butter. The curd from the milk of cows producing butter of dark color is normal, but the curd from the cream of these cows has a pinkish color.

It is recommended that cows be kept off pasture while the aphid infestation is at its height, particularly in the spring, that pasteurization be dispensed with for a time, that the butter be made unsalted, and that methods of manufacture be used which tend to reduce the curd content to a minimum in order to prevent the appearance of the greenish color in butter.

Increasing the yield of cheese by the addition of calcium chloride to milk, G. KNAYSF and J. D. NELSON (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 396-399).—In preliminary work at the New York Cornell Experiment Station, the addition of calcium chloride to the milk previous to the adding of rennet extract has caused an increase in the resulting yield of American Cheddar cheese. Four experiments were carried out, in which the mixed milk was divided into two equal parts and treated as nearly alike as possible, except that one portion received CaCl_2 and a smaller amount of rennet extract. In two tests 3.4 oz. of anhydrous CaCl_2 was added to approximately 280 lbs. of milk, while in the other tests 4.4 oz. of crystallized CaCl_2 was added to the same amount of milk. The average increase in yield in the case of dry CaCl_2 was 5.5 per cent and in the case of crystallized CaCl_2 3.5 per cent.

In these experiments the increase in the yield of cheese was due to more moisture and fat incorporated and to an increase in the milk solids-not-fat retained in the cheese. Aside from the increased yield, there is a saving of rennet extract and a possibility of reducing the amount of starter needed. The cheese probably has a higher nutritive value due to a more complete precipitation of calcium and phosphorus, and there were no indications of impairing either the flavor or ripening qualities of the cheese by the use of CaCl_2 .

Concerning the addition of calcium chloride to milk for cheese making, W. V. PRICE (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 373-376).—In continuing the work noted above, 10 batches of milk of 600 lbs. each were divided into two equal lots and handled alike, except that to one portion 4.6 oz. of anhydrous CaCl_2 was added. The CaCl_2 stimulated the action of the rennet to such an extent that it was necessary to reduce the amount to one-half that used in the check lot. In this work there was a significant increase in yield and fat content of the cheese in which CaCl_2 was used, but no significant increase in moisture and solids-not-fat. After 11 months the cheeses were scored by three judges, and there was no significant difference found in the score of the two cheeses.

The manufacture of Monterey cheese, C. A. PHILLIPS (*Calif. Agr. Col. Ext. Circ. 13* (1927), pp. 20, figs. 8).—Directions are given for the manufacture of Monterey cheese.

Factors that affect the whipping quality of ice cream mixes, H. H. SOMMER (*Ice Cream Rev.*, 11 (1927), No. 2, pp. 86, 88, 90, figs. 5).—In a series

of studies at the Wisconsin Experiment Station it was found that the fat and serum solids content of an ice cream mix had little effect upon the whipping qualities. Sugar, gelatin, and egg solids usually increased the whipping time. Homogenized mixes whipped faster and to a larger volume than the unhomogenized mixes. Aging 24 hours produced a decided improvement in the whipping ability of mixes and 48 hours' aging a slight additional gain, but 72 hours' aging was of only slight advantage. Ripening and neutralizing had little or no effect upon whipping. The whipping ability of a mix limits the stiffness to which the product may be frozen, and since the mixes that are frozen stiffest in the freezer have the best texture, this ability of a mix is important.

VETERINARY MEDICINE

Annual report on the Punjab Veterinary College, Civil Veterinary Department, Punjab, and the Government Cattle Farm, Hissar, for the year 1925-26, C. A. BARRON, D. MILNE, W. TAYLOR, T. F. QUIRKE, and W. S. READ (*Punjab Vet. Col., Civ. Vet. Dept. [etc.] Ann. Rpt. 1925-26, pp. IV+4+48+XXXIV, pls. 10*).—This is the usual annual report (*E. S. R.*, 57, p. 872).

[Reports of the chief veterinary surgeon for the years 1924 and 1926], J. M. SINCLAIR (*South. Rhodesia, Chief Vet. Surg. Rpts. 1924, pp. 8; 1926, pp. 6*).—Accounts of the occurrence of and work with infectious diseases of livestock for the respective years are given (*E. S. R.*, 51, p. 781).

The transmission of diseases in which ticks are the vectors by the intrajugular injection of an emulsion of the intermediate host [trans. title], A. THEILER and P. J. DU TOIT (*Bul. Soc. Path. Exot.*, 19 (1926), No. 8, pp. 725-737).—The authors find that the *Hickettsia* of heartwater can be transmitted by the intrajugular injection of an emulsion of *Amblyomma hebraeum* infected nymphs. Likewise, East Coast fever can be transmitted by such injection of an emulsion of engorged adults or nymphs where the engorgement continues for more than 72 hours but not beyond 120 hours. No transmission took place from the injection of an emulsion of nonengorged ticks.

Variations in the scours type of *Bacillus coli* from the standpoint of bacteriophagic action, J. B. NELSON (*Jour. Expt. Med.*, 46 (1927), No. 4, pp. 549-555).—In the author's studies the lytic agent was not demonstrable in culture filtrates of either the parent or variant type of the scours organism. The parent type was resistant to the action of a "weak" bacteriophage, obtained from the animal host, while the variant type was susceptible. Exposure of the variant type to the scours bacteriophage was attended by agglutination of the cells, marked swelling, and an alteration of the contents prior to lysis. The manifestations of variation which regularly occur on agar plate cultures of the scours organism do not appear to be the result of bacteriophagic stimulation.

Studies on a paratyphoid infection in guinea pigs, I-III (*Jour. Expt. Med.*, 45 (1927), No. 2, pp. 353-363, 365-377; 46 (1927), No. 4, pp. 541-548).—In part 1 of this report of studies, J. B. Nelson and T. Smith report on a natural outbreak of paratyphoid in a guinea pig population and consider the bacteriology of the causal organism with particular reference to agglutinative affinities. Part 2, by T. Smith and J. B. Nelson, deals with the factors involved in the transition from epidemic to endemic phase. In part 3, J. B. Nelson discusses a second type of *Salmonella* naturally appearing in a guinea pig population in the endemic stage of an earlier epidemic, of which the organism involved, from its agglutinative affinities, was judged to be an *aertrycke* type of *Bacillus paratyphi*.

Synthetic mediums in the identification of the typhoid-paratyphoid bacteria. L. THOMPSON (*Jour. Infect. Diseases*, 41 (1927), No. 1, pp. 16-20).—Forty-nine cultures of typhoid and paratyphoid bacteria were tested by the author for their ability to grow in synthetic media to which various substances were added as the source of nitrogen. Valine and glutamic acid hydrochloride were selected as the most suitable among the compounds tried for differentiation of members of this group.

With valine growth was obtained in 3 per cent of the typhoid cultures, 10 per cent of the paratyphoid A cultures, and 100 per cent of the paratyphoid B cultures. With glutamic acid hydrochloride, the percentages of positive growth were for typhoid 18, paratyphoid A 80, and paratyphoid B 100 per cent. Sixteen cultures of nonlactose-fermenting Gram-negative bacilli, other than the typhoid and paratyphoid cultures, were tried on these two media for comparison. The reactions seemed specific for each species tried. It is concluded that synthetic media could be used to advantage as an additional cultural test in the identification of the bacteria studied.

Changes in the blood in the course of coccidiosis of animals [trans. title] (*Bul. Soc. Path. Exot.*, 19 (1926), No. 6, pp. 427-429).—The Blood in Bovine Coccidiosis is dealt with by W. L. Yakimoff and E. N. Markoff-Petrashewsky, and The Blood in Coccidiosis of White Rats by W. L. Yakimoff and A. M. Dawydoff.

Researches on the transmission of pasteurellosis in the large ruminants through the digestive tract [trans. title], H. JACOTOT (*Bul. Soc. Path. Exot.*, 19 (1926), Nos. 9, pp. 853-858; 10, pp. 910-915).—This includes a report upon the administration of the hemorrhagic septicemia organism to young cattle by ingestion.

An epizootic among meadow mice in California caused by the bacillus of mouse septicemia or of swine erysipelas. N. E. WAYSON (*Pub. Health Rpts.* [U. S.], 42 (1927), No. 22, pp. 1489-1493).—During the course of the migration of large numbers of native meadow mice (*Microtus californicus estuarensis*) and house mice (*Mus musculus*) from a land basin in Kern County, Calif., to outlying agricultural districts, an epizootic appeared among them that was caused by *Bacillus murisepticus*. It is pointed out that the difference between *B. murisepticus* and *B. rhusiopathiae suis*, the cause of swine erysipelas, has never been determined, and that the organisms are very closely related or identical. The author considers the virulence of this organism to be subject to such vagaries and the pathogenicity of some strains to swine and to man so well established that this unusual epizootic may be of importance both to the public health and to the hog industry of California.

The relation of monocytes and clasmatocytes to early infection in rabbits with bovine tubercle bacilli. F. R. SABIN and C. A. DOAN (*Jour. Expt. Med.*, 46 (1927), No. 4, pp. 627-644, pl. 1).—The authors have found that the early reaction to intravenous tubercular infection in the various organs of the rabbit reveals a pathognomonic response in the lungs within 24 hours and that the specific response in the liver, spleen, lymph, glands, and bone marrow follows from the sixth to the fourteenth day. The development and extent of the pathologic process has been analyzed in terms of the activity of monocytes and clasmatocytes. The criteria for differentiating these mononuclear phagocytic cells into two strains have been analyzed and the techniques discussed. The clasmatocyte phagocytizes tubercle bacilli freely and fragments them, as it does all cellular and other debris. The monocyte stimulated to metamorphose into the typical epithelioid and giant cell of the Langhans type retains the tubercle bacilli intact, with power to survive and multiply, over long periods of time. The normal number of monocytes or the degree to which

monoblasts may be stimulated to development and maturation, together with the activity of the clasmatoocytes in destroying bacilli in any particular region, would appear to be a function of the rapidity and extent of the local tubercular involvement.

Tuberculosis research.—Interim report of experiments on calves in relation to susceptibility, infection, and immunity, E. A. WATSON (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 6, pp. 732-741).—This is a contribution from the Pathological Division, Health of Animals Branch, Department of Agriculture, Ottawa, Canada.

The relationship of the lethal power to the skin-reacting power of tuberculin, M. DORSET, R. R. HENLEY, and H. E. MOSKEY (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 4, pp. 487-492).—This is a report of studies conducted with a view to determining whether or not the lethality of a tuberculin is an accurate guide to its power to produce skin reactions and whether the death of tuberculous guinea pigs following the injection of tuberculin is caused by the same substance as that which gives rise to the intradermic reaction. The studies are presented under the headings of dialysis experiments and ammonium sulfate experiments.

The results led to the conclusion that there is no question but that at least two active substances were present in the tuberculin used, one of which was capable of inducing typical skin reactions in guinea pigs and at the same time possessed moderate lethal power. The other was decidedly lethal for sensitive guinea pigs yet caused no skin reactions. The fact that the residue in the dialyzers as well as the ammonium sulfate precipitate always displayed a certain amount of lethal power suggests that the skin-reacting principle may be a complex molecule of which the lethal principle is a necessary part, or that the two substances may be united at times although independent in their action. It has been shown that in the case of the fractions lethal power is not an accurate guide to the skin-reacting power for guinea pigs. Whether or not the lethal principle is always present in tuberculin in a fixed relative proportion to the skin-reacting principle remains to be determined.

Bang bacillus disease (bovine infectious abortion), M. F. BARNES and A. L. BRUECKNER (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 5, pp. 578-584).—This is a report of the results of agglutination tests made of five bovine sera at varying dilutions by each of 12 different laboratories. From the standpoint of pronouncing the sera either positive or negative the results reported by the 12 laboratories were approximately 99 per cent in agreement.

A rapid method for the isolation of *Bacillus abortus* from uterine exudate and diseased placenta, J. B. NELSON (*Jour. Expt. Med.*, 43 (1926), No. 3, pp. 331-338).—A rapid method is described for the isolation of *B. abortus* from the peritoneal cavity of the guinea pig following the injection of uterine exudate or placental tissue.

Variations in CO₂ requirements among bovine strains of *Bacillus abortus*, T. SMITH (*Jour. Expt. Med.*, 43 (1926), No. 3, pp. 317-325).—Strains of *B. abortus* freshly isolated vary in their carbon dioxide requirements. The origin and sources of the strains growing with less dependence on carbon dioxide (or sealing) may be in vaccinal strains or possibly in continued existence in the udder. The importance of these possibilities makes it desirable that all strains isolated should be subjected to some such test as is outlined.

Further data on the effect of vaccination against bovine infectious abortion, T. SMITH and R. B. LITTLE (*Jour. Expt. Med.*, 43 (1926), No. 3, pp. 327-330).—The partial protection afforded by four injections of a heated culture of *Bacillus abortus* of normal virulence during the first pregnancy is in part lost in the second. The superiority of a single injection of a living culture of rela-

tively low virulence is evident in both pregnancies. In the experiment described the protection was complete.

Bang bacillus disease (bovine infectious abortion), T. E. MUNCE (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 3, pp. 322-338).—This is a report upon the prevention, repression, and eradication work under way in Pennsylvania by the so-called Pennsylvania Plan, first put into operation in 1920. The plan is based upon sanitary principles and includes repeated blood testing of the herd and elimination of reactors. The first "Abortion Free" certificate was issued December 16, 1921.

Agglutinin response to certain *Brucella abortus* bacterins, S. J. SCHILLING and W. L. BLECKER (*Jour. Infect. Diseases*, 41 (1927), No. 3, pp. 222-232).—This contribution from the Arkansas Experiment Station reports upon tests made of several types of *B. abortus* bacterins and vaccines for antigenic efficacy in rabbits, the results being determined by the agglutination titers of the rabbit serum at selected periods.

In three separate trials there were found to be marked individual variations in antibody production in the treated animals. The results obtained show that in many animals *B. abortus* vaccine or bacterin will induce no immunity whatever. The loss of antigenic qualities of *B. abortus* during cultivation on laboratory mediums was marked, a fact undoubtedly related to the variability of results as reported by investigators with large animals. Treatment with live cultures did not uniformly induce a higher agglutination titer than treatment with bacterin. No uniform superiority appeared in any of the different types of bacterins in inducing high agglutination titer. The results do not indicate that the use of live cultures or of bacterins yields significant differences in the persistence of the immunity.

Recent developments in the control of Johne's disease, L. B. ERNEST (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 6, pp. 742-749).—This is a discussion of the disease, including observations of a badly infected herd and the study of approximately 100 diseased animals.

Ostertagia ostertagi in California cattle, with copper sulphate an apparently successful therapeutic, E. H. BARGER (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 5, pp. 560-567, fig 1).—The author reports upon an outbreak of strongylosis due to *O. ostertagi* which occurred in the San Joaquin Valley in California during the winter of 1926-27, and in which 35 head of yearling calves were visibly affected. The disease made a fairly rapid progress in the herd after first being observed, with a total loss of 11 head from all causes, including drenching and those destroyed for autopsy. The important symptoms in this outbreak were emaciation, anemia, weakness, rough coat, and diarrhea of varying severity. In only one animal was edema of the sub-maxillary region observed. Copper sulfate coated grain appeared to have some beneficial effect in controlling the condition.

The resistance of erythrocytes in bovine piroplasmosis [trans. title], W. L. YAKIMOFF and A. M. WOŁEZHOWSKY (*Bul. Soc. Path. Exot.*, 19 (1926), No. 7, pp. 548, 549).—With piroplasmosis of cattle in northwestern Russia the number of red blood cells is reduced and sometimes considerably so.

Concerning the immunization of bovines to piroplasmosis in Russia [trans. title], W. L. YAKIMOFF, E. N. MARKOFF-PETRASCHEWSKY, and W. A. LOUKIANOFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 7, pp. 550-554).—The authors conclude that it is possible to immunize bovines, at least young animals, with trypanblue alone for a period up to 60 days. Although the parasites appear in the blood, hemoglobinuria is always absent.

Apiroplasmine in the treatment of bovine piroplasmosis [trans. title], W. L. YAKIMOFF, J. G. GALOUZO, W. A. LOUKIANOFF, and M. J. FURIKOFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 1, pp. 18-21).—The authors' observations on the effect of apiroplasmine leads to the conclusion that it is not very effective in the treatment of this disease. Apiroplasmine is a liquid composed of caffeine cacodylate 80 per cent, benzoinomonicarbonic acid 10 per cent, and sodium carbonate 2 per cent.

Arrhenal in the treatment of bovine piroplasmosis [trans. title], W. L. YAKIMOFF, E. N. MARKOFF-PETRASCHEWSKY, A. N. GNÉDINE, E. F. RASTÉGAÏEFF, E. W. ROUMIANZEFF, and M. F. TURIKOFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 7, pp. 554-557).—This is a preliminary note on the use of sodium methyl arsenate. There was a mortality of 8 per cent in the cases treated.

Essay on the treatment of bovine piroplasmosis by protargol [trans. title], W. L. YAKIMOFF, E. N. MARKOFF-PETRASCHEWSKY, J. C. GALOUZO, W. L. LOUKIANOFF, E. F. RASTÉGAÏEFF, E. W. ROUMIANZEFF, and A. M. WOITZEKHOWSKY (*Bul. Soc. Path. Exot.*, 19 (1926), No. 1, pp. 41-49).—It is concluded that protargol should be placed in the list of products of value in combating piroplasmosis.

Treatment of piroplasmosis due to *Piroplasma bigeminum* in the north of the Caucasus [trans. title], W. S. BÉLAWINE (*Bul. Soc. Path. Exot.*, 19 (1926), No. 9, pp. 786-791).—It is concluded that ichtargan occupies the first place as a specific remedy in combating *P. bigeminum*, followed by protargol and trypanblue administered intravenously.

The action of ichtargan and luargol on bovine piroplasmosis [trans. title], W. L. YAKIMOFF, W. J. WASSILEWSKY, M. F. IWANTSCHIKOFF, E. F. RASTÉGAÏEFF, J. S. OULASSÉWITSCH, and B. W. ZAWIALOFF (*Bul. Soc. Path. Exot.*, 18 (1925), No. 1, pp. 51-53).—The authors report upon the treatment of nine animals with ichtargan and four with luargol, the results showing these medicaments to be effective against bovine piroplasmosis.

Ichtargan in the treatment of bovine piroplasmosis in northwest Russia [trans. title], W. L. YAKIMOFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 1, pp. 16-18).—The author reports upon the use of ichtargan in the treatment of piroplasmosis, this medicament consisting of a combination of silver and ichthyol, long used in human medicine. It was first employed in the treatment of bovine piroplasmosis by Schmidt, a German veterinarian, and is in common use in Finland. During the summer of 1925, 511 animals were treated with it, being administered intravenously, adult animals receiving from 1 to 1.5 gm. The mortality was but 4.8 per cent.

The treatment of bovine piroplasmosis by silversalvarsan [trans. title], W. L. YAKIMOFF, E. N. MARKOFF-PETRASCHEWSKY, J. P. GALOUZO, W. A. LOUKIANOFF, A. M. WOITZEKHOWSKY, and S. P. YAKOWLEFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 1, pp. 34-41).—It is concluded that silversalvarsan is of considerable value in the treatment of bovine piroplasmosis.

Combating piroplasmosis in the Government of Petrograd in 1925 [trans. title], W. L. YAKIMOFF (*Bul. Soc. Path. Exot.*, 19 (1926), No. 1, pp. 14, 15).—In this preliminary note the author reports upon the results of treatment of 743 animals. Of 511 animals treated with ichtargan 4.8 per cent died, of 67 to which arrhenal was administered intravenously 7.4 died, and of 136 to which it was given subcutaneously 8.8 per cent died. Two of 4 to which apiroplasmine was administered succumbed. Of 15 treated with protargol, 8 with silversalvarsan, and 2 with luargol none succumbed.

The treatment of bovine piroplasmosis with silver salts [trans. title], W. L. YAKIMOFF, A. J. KÉDRINSKY, J. A. AFANASIEFF, P. S. IWANOFF, and S. A.

SWIRSSKY (*Bul. Soc. Path. Exot.*, 19 (1926), No. 10, pp. 887-890).—The details are given of experiments conducted with albargine, argoflavine, and silvernovarsolan during the summer of 1926 in continuation of work with ichtargan, protargol, luargol, and silvernovarsolan (Russian neosilversalvarsan).¹ (See also above.)

Studies of actinomycosis in cattle [trans. title], J. A. GUNST (*Tijdschr. Diergeneesk.*, 54 (1927), No. 12, pp. 552-560, figs. 5; *Ger., Eng., Fr. abs.*, pp. 559, 560).—This is an extended account of studies of 125 cases of actinomycosis.

A treatment for liver-fluke infestation in goats, J. N. SHAW and B. T. SIMMS (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 6, pp. 723-727).—This is a contribution from the Oregon Experiment Station in which the authors report upon studies that have led to the conclusion that carbon tetrachloride in doses of 1 cc. is a satisfactory treatment for liver fluke infestation in goats.

The occurrence of pinworms in goats in the United States, B. SCHWARTZ (*North Amer. Vet.*, 8 (1927), No. 10, pp. 22, 23, figs. 5).—A pinworm from goats, here described for the first time from the United States, is considered to be identical with *Skrjabinema ovis*, a parasite of sheep and goats in Russia.

Studies in infectious enteritis of swine, C. MURRAY, H. E. BIESTER, P. PURWIN, and S. H. McNUTT (*Jour. Amer. Vet. Med. Assoc.*, 72 (1927), No. 1, pp. 34-89, figs. 30).—In studies of infectious or necrotic enteritis of swine extending over a period of three years, *Salmonella suispestifer* was found to be the primary etiological agent. *Actinomyces necrophorus* appeared consistently as a secondary invader. *Balantidium coli* and *Trichomonas suis* were eliminated as specific causative factors in infectious enteritis of swine, while in the small number of human intestines studied *B. coli* possessed marked properties of active primary invasion of the tissues. In over 50 per cent of the cases of infectious enteritis studied, *B. coli* and *T. suis* were absent.

Infectious or necrotic enteritis was consistently induced experimentally by feeding broth cultures of the *suispestifer* type organism, which could be reisolated and in turn passed through successive series of pigs, producing typical lesions in these. The intestinal lesions in well-developed cases of infectious enteritis were characterized by three zones of reaction: Caseation necrosis, karyorrhexis, and leucocytosis.

The primary causative organism was found most abundantly in the upper portions of the lesion, where aerobic conditions prevailed. The consistent secondary invader was found in the deeper strata of the lesions, where anaerobic conditions prevailed. A limited number of sections of intestine from human typhoid fever presented a large strandlike organism in the deeper portions of the lesions, resembling *A. necrophorus*. Button ulcers of hog cholera were characterized by some features present in the lesions of infectious enteritis, with some modifications. *A. necrophorus* was found in the deeper portions of the lesion. One case of "bloody diarrhea" revealed numerous spirilla in the intestinal lesions. This case presented some features not present in the infectious enteritis lesions.

A list is given of 41 references to the literature.

Concerning the treatment of dourine of the horse with atoxyl [trans. title], W. L. YAKIMOFF (*Bul. Soc. Path. Exot.*, 18 (1925), No. 1, pp. 55-57).—A report on the use of atoxyl in continuation of earlier work,² excellent results being obtained in the treatment of dourine.

¹ *Bul. Soc. Path. Exot.*, 18 (1925), No. 1, pp. 51-53.

² *Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 9 (1911), Nos. 5, pp. 307-324; 6, pp. 392-423.

The possible rôle of radiant therapy in demodectic mange, J. G. HARDENBERGH and C. SHEARD (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 5, pp. 607-617, figs. 3).—In investigations conducted the authors find that at about 40° C. the movements of *Demodex folliculorum* become fairly marked under the microscope and at 45° marked and active. This furnishes a simple criterion by which living *Demodex* may be selected from dead *Demodex*.

A temperature of $54^{\circ}\pm 1^{\circ}$, obtained either by ordinary heating methods or from infra-red irradiation, applied for a period of from 5 to 10 minutes, is lethal to *Demodex*. Weak solutions of mercurochrome have no apparent effect in hastening the death of the parasites or of causing them to die at a temperature lower than $54^{\circ}\pm 1^{\circ}$.

Immediately after irradiation with the ultra-violet lamp for from 2 to 20 minutes, there is increased activity of *Demodex* kept under the initial control temperature of 25°. Irradiation for from 15 to 30 minutes by the energy from a quartz mercury arc lamp, operated at 90 volts at a distance of 50 cm., produces lethal effects in some instances at the end of 24 hours at the control temperature of 25°, and general destruction of all directly irradiated parasites follows within 48 hours after such initial periods of irradiation. Irradiation of the parasites with ultra-violet light, followed by dry heat or infra-red irradiation, causes lethal effects at temperatures considerably below those at which death takes place normally. Simultaneously irradiation with ultra-violet light (from a quartz mercury vapor lamp) and infra-red (heat) energy produces lethal effects more rapidly than does the consecutive application of these two types of irradiation. The daily irradiation of an animal affected with demodectic mange for from 15 to 45 minutes with an air-cooled quartz mercury arc lamp, operated at 90 volts at a distance of 50 cm., apparently maintains the general physical tone of the whole animal at a higher level, and thereby aids in combating the untoward conditions set up in the host by the invading parasites.

Seasonal distribution as an aid to diagnosis of poultry diseases, W. R. HINSHAW and L. D. BUSHNELL (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 6, pp. 764-772, figs. 3).—This is a contribution from the Kansas Experiment Station which reviews the literature and reports upon a monthly summary of 3,516 outbreaks of poultry diseases in Kansas extending over a period of 14 years. The diseases studied include bacillary white diarrhea, coccidiosis, worms, fowl cholera, fowl typhoid, avitaminosis, tuberculosis, botulism, and blackhead.

Biological and medicinal agents for poultry, A. BROERMAN (*Jour. Amer. Vet. Med. Assoc.*, 70 (1927), No. 5, pp. 597-604).—The author discusses methods for the destruction of external parasites and the removal of internal parasites, and considers the value of vaccines, bacterins, and agglutinins and the uses of the tuberculin and the intradermal test for *Salmonella pullorum* infection.

The results obtained from the use of the agglutination and intradermal tests in a flock of 50 Rhode Island Red hens are reported upon. Thirty-four of the fowls were negative to both tests, 16 reacted to one or both tests, and 2 reacted positively and 1 doubtfully to the agglutination test, while 2 were considered positive and 14 doubtful reactors to the intradermal test. A retest of all doubtful and positively-reacting fowls was made 3 months later, at which time 2 had died, 5 reacting to both tests with a disagreement in 2 birds. It is concluded that the intradermal test is of value in detecting the infected birds, but has its limitations. Whenever possible it should be used in combination with the agglutination test.

On the virus of avian spirochetosis in Algeria and its longevity in *Argas persicus* [trans. title], A. CATANÉI and L. PARROT (*Bul. Soc. Path. Exot.*, 19

(1926), No. 6, pp. 419-421).—An experimental comparative study of *Spirochaeta gallinarum* from Brazil and the virus affecting fowls in north Algeria has shown them to be identical. A fowl inoculated with the spirochete from the duck succumbed to spirochetosis. It was found that *S. gallinarum* remained virulent in the fowl tick (*A. persicus*) for more than two years.

Bibliography of bacillary white diarrhea infection of the fowl, W. A. HOOKER (U. S. Dept. Agr., Off. Expt. Stas., 1927, pp. 29).—This is a mimeographed bibliographical list of the literature relating to *Bacterium pullorum* issued prior to July 1, 1927.

Atypical symptoms and lesions occurring in chicks harboring *Bacterium pullorum*, H. J. STAFSETH and E. P. JOHNSON (Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 4, pp. 471, 472).—These data have been noted from another source (E. S. R., 57, p. 575).

A comparison of the agglutination test and the intradermal test in the detection of bacillary white diarrhea, P. R. EDWARDS and F. E. HULL (Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 5, pp. 590-599).—This is a contribution from the Kentucky Experiment Station in which the data presented have led to the conclusion that the agglutination test is a much more reliable method of testing fowls for *Bacterium pullorum* infection than the intradermal test employed in this study.

An improved antigen for the agglutination test in bacillary white diarrhea, W. L. MALLMAN (Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 5, pp. 600-606).—A *Bacterium pullorum* antigen containing 1 cc. of N NaOH to 100 cc. of antigen is recommended for the routine agglutination test for bacillary white diarrhea. This antigen is slightly more sensitive than the usual antigen and has the added advantage of entirely eliminating cloudy reactions. The starving of birds for 48 hours previous to bleeding is not necessary when this antigen is used.

Factors influencing the control of bacillary white diarrhea, F. P. MATHEWS (Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 5, pp. 585-589; also in Vet. Rec., 7 (1927), No. 40, pp. 837-839).—This is a contribution from the Indiana Experiment Station.

In considering cases in which a second or third application of the agglutination test shows an increase in the number of reacting birds, it is pointed out that in some instances this is caused by the feeding of infertile eggs gathered from incubators. The fact that the test detects fowl typhoid infection as well as bacillary white diarrhea, while fortunate, may explain reactions obtained in some instances.

In studies made of eight disease-free pullets that were fed three incubated eggs from reacting hens on March 15, 1926, egg production ceased in about one week, but no other ill effect was observed. All reacted on April 2 and all but one on May 11 and August 15. All were autopsied, and the ovary failed to show any infection in the bird that reacted on April 2 but not on May 11 and August 15, but the ovaries of 6 of the remaining 7 were pathological and *Bacterium pullorum* was isolated therefrom.

Reference is made to a flock in which from 15 to 80 per cent of the hens in the different lots reacted to the agglutination test and were removed in 1926 prior to the hatching season. The flock was again tested in 1927 prior to the hatching season, and but 3 per cent of the birds reacted.

In experiments in which feces from 16 infected hens were added to the feed of 24-hour-old chicks, no infection took place, as determined by post-mortem examination when 2 to 3 weeks of age. Other noninfected 24-hour-old chicks were allowed to mingle freely with three hens for a period of 2 to 3 weeks, and

they similarly failed to become infected, as determined by post-mortem examination. A repetition of the experiment with 24-hour-old chicks also gave negative results.

The results are considered to indicate that the spread through cohabitation in this manner is of minor importance. However, it is considered highly probable that accidentally broken and consumed eggs from infected birds offer a better explanation for the spread of the disease in mature fowls through cohabitation than through the droppings of infected individuals, since the eating of broken eggs is of common occurrence in all flocks.

Fowl pox prevention by immunization, W. T. JOHNSON (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 6, pp. 750-763).—In this contribution from the Oregon Experiment Station the author reports upon work with an active virus in immunizing young fowls on the range.* By this method the disease was satisfactorily controlled in the laying house. Immunity to comb infection followed leg vaccination, and immunity to leg infection followed comb inoculation. Inoculation of 13 fowls 23 days after vaccination did not produce pox, and fowls vaccinated in this way when 4 months of age were immune to experimental inoculation nearly 11 months later.

It is pointed out that the method here described and employed at the Oregon Station should not be confused with that of De Blicck and Van Heelsbergen previously noted (*E. S. R.*, 57, p. 878), since those investigators claim antidiphtherin to be a special product which they use in vaccinating laying stock as well as young and which requires scarification. The author's method, on the other hand, is not used for laying stock and relates to the use of active, disease-producing virus which is unmodified and is referred to as virus vaccination.

Laying fowls, fowls under 2 months of age, and weak young fowls are particularly likely to develop unfavorable reactions and high mortality. The observations indicate that young stock is less likely to develop natural infection than mature stock. The indications are that continuous application of virus-vaccination may produce strains with slightly increased resistance to pox, and that lower mortality may later be expected from vaccination.

One vaccinator, with assistance for catching and holding the fowls, can vaccinate about 400 fowls per hour. The cost of vaccination is less than that of any previously used.

Antidiphtherin vaccine for diphtheria and pox in poultry, G. H. G. HOL (*North Amer. Vet.*, 8 (1927), No. 10, pp. 44-46).—This is a report of vaccinations of poultry made by the author in Purmerend, Netherlands, with the method of De Blicck and Van Heelsbergen, previously noted (*E. S. R.*, 57, p. 878).

The effect of fowl typhoid vaccination upon the macroscopic agglutination test for *Salmonella pullorum* infection, R. A. RUNNELLS and F. THORP, JR. (*Jour. Amer. Vet. Med. Assoc.*, 72 (1927), No. 1, pp. 90-105, figs. 2).—This is a contribution from the Virginia Experiment Station in which, following a review of the literature, the authors report upon their methods of investigation and results obtained in the work conducted, the details of which are given in tabular and chart form.

It was found that a minimum period of 9 days and a maximum period of 36 days elapses before the serum titers of fowls once inoculated with fowl typhoid vaccine drop to normal. A minimum period of 23 days and a maximum period of 65 days elapses before the serum titers of fowls inoculated twice return to normal. A second vaccination is responsible for greater and more lasting agglutination production. Individuals vary in their ability to produce

agglutinins. Agglutinin production following vaccination is transitory and not permanent. There is danger of confusion in interpreting the results when testing for bacillary white diarrhea infection by the macroscopic agglutination test after fowl typhoid vaccination. The authors found that *S. gallinarum* could not be differentiated serologically from *S. pullorum* by the agglutination test, using both the homologous and heterologous antigens. *S. gallinarum* immune sera agglutinated the homologous antigen in most cases better than the heterologous antigen.

Idiopathic streptococcic peritonitis in poultry, H. C. H. KERNKAMP (*Jour. Amer. Vet. Med. Assoc.*, 70 (1927), No. 5, pp. 585-596).—This contribution from the Minnesota Experiment Station reports upon a primary fibrinous inflammation of the peritoneum of poultry, which has been observed in fowls from Olmstead and Carver Counties. *Streptococcus pyogenes* was isolated from all cases and when injected into susceptible birds produced a disease typical of the original cases. The disease under natural conditions and in several birds artificially infected has a chronic course. Peritonitis was not induced in susceptible birds under artificial conditions by administering the virus directly into the digestive tube. The organism was avirulent after nine months of artificial cultivation on serum agar, and its power to cause hemolysis or ferment lactose, saccharose, and salicin was not changed.

On the frequency of spontaneous tumors in the domestic fowl, M. SCHNEIDER (*Jour. Expt. Med.*, 43 (1926), No. 3, pp. 433-441, fig. 1).—This contribution from the Connecticut Storrs Experiment Station reports upon an analysis of records from the Storrs contest, the Harper Adams trials, and a farm flock which indicate an increase of tumors in the second half of the pullet year (May through October) over the first half (November through April). Some evidence seems to indicate that heavy antecedent egg production is associated with a rise in tumor rate. The normal annual tumor rate for fowls between the ages of 6 and 18 months is about 2 or 3 per cent. The appearance of tumors in "epidemic" form is thought to indicate that the neoplasms found differ in etiology from those upon which the normal rate is based.

Two interesting turkey diseases, E. JUNGHEER (*Jour. Amer. Vet. Med. Assoc.*, 71 (1927), No. 5, pp. 636-640, figs. 2).—This is a contribution from the Montana Experiment Station in which the author describes the nematode *Capillaria annulata*, which parasitized young turkeys, and a new mycosis characterized by a chronic ulceration of the esophagus, crop, and glandular stomach.

Pseudotuberculosis of the canary bird [trans. title], T. VAN HEELSBERGEN (*Tijdschr. Diergeneesk.*, 54 (1927), No. 12, pp. 545-549, figs. 3; *Ger., Eng., Fr. abs.*, p. 549).—The investigations here reported show the disease in canary birds which is characterized by gray-colored lesions in spleen and liver to be pseudotuberculosis.

AGRICULTURAL ENGINEERING

Precise weir measurements, E. W. SCHODER and K. B. TURNER (*Amer. Soc. Civ. Engin. Proc.*, 53 (1927), No. 7, pt. 1, pp. 1395-1504, figs. 49).—This paper presents the results of extensive new volumetric measurements of the discharge over weirs of the sharp crested type, occupying the full width of the channel.

The results show the extent and nature of the inadequacy for general precise work of formulas that introduce merely the mean velocity of approach or that, as the equivalent, introduce merely the height of weir. The inadequacy is also shown of curves and tables that merely average or approximate the data

of experiments hitherto published. This inadequacy consists chiefly in the failure to measure and record the distribution of velocities in the channel of approach.

The new experimental data agree with those of Francis, Fteley and Stearns, and Rehbock in their evidence that Bazin's coefficients and formula for sharp crested weirs give too high discharges for low heads by fully 2 to 3 per cent for heads of 0.3 to 1.2 ft. The use of the simple Francis weir formula as a basic formula is substantiated for cases closely approximating the ideal weir with a truly sharp, square edge, with smooth, vertical upstream face near the crest, and with negligible effect of velocity of approach.

The percentage increase in discharge due to a slight rounding of the upstream top corner of the crest is shown to be as much as 2 per cent for heads of 0.5 ft. and 0.5 per cent for heads of 1.33 ft. A rounding of a 0.125-in. radius causes about 3 per cent and a 0.25-in. radius about 5.5 per cent increased discharge at 0.5-ft. head. The percentage increase in discharge due to changing the roughness of the upstream face of the weir bulkhead from that of a polished brass plate to that of a coarse file for a distance of 12 in. below the crest is shown to range from about 2 per cent for a 0.5-ft. head to about 1 per cent for a 1.35-ft. head.

No justification is given for a taboo on a weir with a head of water as great as or greater than the height of the crest above the bottom of the channel. Data on other details of precise weir measurement are also presented.

Rainfall and run-off, E. G. MARRIOTT (*Engin. Jour. [Canada]*, 10 (1927), No. 9, pp. 421-426, figs. 12).—An analysis of rainfall and run-off is given, based on actual data, with a view to estimating the discharge of streams from records of precipitation.

The use of irrigation water by native farmers in the Residency of Surabaya [trans. title], G. J. VINK, W. A. HORST, and E. DE VRIES (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Korte Meded. Afd. Landb.*, No. 4 [1927], pp. 46, figs. 2; *Eng. abs.*, pp. 42-46).—The results of a survey made in 1923, 1924, and 1925 of the use of irrigation water by native farmers of the Residency of Surabaya in the Dutch East Indies in the dry season are presented. Special attention was given to the use of irrigation water on rice on loam and sandy soils. A rather detailed analysis of the results is presented.

One of the outstanding findings was that on heavy soils drying after plowing is detrimental in two ways. In the first place a larger quantity of water is required for the second plowing, and in the second place the development of the crop is insufficient although sufficient water may be available later. No correlation could be discovered between the quantity of water required for plowing and for the crop on heavy clay loam soil.

Some commercial softwoods of British Columbia, T. A. McELHANNEY and R. S. PERRY (*Canada Dept. Int., Forest Serv. Bul. 78* (1927), pp. 45, figs. 22).—The purpose of this bulletin is to provide reliable data on some of the principal commercial timbers of British Columbia, with particular reference to their mechanical and physical properties. The results of a number of tests of different woods are tabulated.

The manufacture and use of small dimension, R. J. HOYLE (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 20* (1927), pp. 94, figs. 25).—This publication is written with the idea of encouraging the manufacture of small dimension lumber. It emphasizes the difficulties and problems of manufacture and devotes considerable space to the matter of consumption of small-dimension material.

An investigation of web stresses in reinforced concrete beams, F. E. RICHART (*Ill. Univ., Engin. Expt. Sta. Bul. 166* (1927), pp. 106, figs. 34).—The

results of tests over a period of 12 years of reinforced concrete beams are presented and discussed. The tests were all made on simple beams subject to two-point loading, so that in all cases the web reinforcement was kept in a region of constant shear.

All beams without web reinforcement failed by diagonal tension at shearing unit stresses, varying from 130 to 250 lbs. per square inch with one exception. The beams without web reinforcement all failed quite suddenly, and lacked the desirable characteristics of toughness and ability to yield gradually at failure which were found in those having web steel.

Relatively large diagonal tension stresses were developed when the shearing stress was large in comparison with the flexural stress. This condition was found in short, deep beams and in beams having high amounts of longitudinal reinforcement. It appeared that higher allowable values of shearing unit stress may be used in reinforced concrete beams than are now common, provided sufficient web reinforcement is used to satisfy the design formula and care is taken to guard against other forms of failure.

A somewhat systematic variation, evidently dependent upon the manner of loading, was found in the measured stresses in the web reinforcement at points along the length of the beams. Low stresses were found near the load point and the support, while the maximum stresses were generally found in the middle portion of the region between. The largest number of diagonal cracks generally formed in this middle portion.

A variation in stress was also observed along the length of web members. Except in a few cases in which the stirrup was near the load point, this stress was greatest near the bottom of the web member, decreasing toward the upper end. The position of maximum stress clearly depended upon the intersection of the web member with the main diagonal cracks. Only on the most highly stressed gauge lines did the observed stresses in web members approach the calculated stresses. The ratio between measured and calculated tensile stress in web members increased as the percentage of web reinforcement increased.

The results of the tests agreed fairly well with the theory in indicating approximately equal effectiveness of vertical web members and members inclined at 45° to the horizontal. The difference in effectiveness observed seemed to be in favor of the vertical stirrup.

Determination of pressure distribution on circular pipe when tested in the A. S. T. M. standard sand bearings, D. G. MILLER and P. C. MCGREW (*Amer. Soc. Testing Materials Proc.*, 26 (1926), pt. 2, pp. 611-620, figs. 4).—Studies conducted by the Minnesota Experiment Station, in cooperation with the Department of Drainage and Waters of Minnesota and the U. S. Department of Agriculture, are reported which showed the distribution of pressure on both the top and bottom quadrants of circular pipe when under load in the standard sand bearings as specified for testing drain tile by the American Society for Testing Materials. The distribution of pressure was determined by measuring the starting pull required to move steel strips in canvas laid on the outer circumference of a circular pipe and between the pipe and the sand of the bearings. The conclusions were based on the law of physics that for specific materials the starting force required to overcome starting friction is proportional to the load.

It was found that except under the most favorable conditions the concentration of loading on the bottom quadrant of the pipe tested in the sand bearings is somewhat greater than heretofore assumed, while under unfavorable conditions it may be very much greater. Bedding with loose sand containing 2.5 and 5 per cent of moisture produced the most favorable conditions in the matter of pressure distribution, while bedding with thoroughly compacted dry

sand produced the most severe conditions. Considering all degrees of compactness of sand used in the tests, that with 5 per cent of moisture gave the most consistent results.

A study of hard finish gypsum plasters, T. N. MCVAY (*Ill. Univ., Engin. Expt. Sta. Bul.* 163 (1927), pp. 46, pls. 4, figs. 10).—Studies of the physical properties of hard-finish gypsum plasters and an investigation of the mechanism of setting are reported.

The results indicate the probability that plasters having a high strength may be produced at a relatively low cost in commercial practice. The greater strength of plasters calcined at high temperatures, as compared with those calcined at lower temperatures, appears to be due to the more thorough crystallization of the former and also to the smaller amount of mixing water used, which produces plasters of greater hardness and density.

Plasters of widely varying physical properties can be produced by treating gypsum with soluble sulfates before or after the final calcination. The former method causes the plasters to be more plastic but at the same time to have higher shrinkage. Potash alum seems to produce more satisfactory results than Glauber's salt. The physical properties of the plaster can also be controlled to a considerable degree by the temperature of calcination, assuming that the concentration of the soluble sulfates remains fixed. The higher the temperature of calcination the slower are the reactions that take place in setting.

Rural electrification in Sweden, A. EKSTRÖM (*Jour. Farmers' Club [London]*, 1927, pt. 4, pp. 61–84, fig. 1).—The results of a general survey of the use of electricity on Swedish farms are presented, with data particularly on the calculation of energy consumption and the processes of generating and distributing energy.

With reference to tariffs it is pointed out that in Sweden a certain price per kilowatt-hour is, to a large extent, charged in the sale of electric energy. In many places a higher price is charged for lighting and a lower price for motor power requiring the use of special meters for the different purposes. Elsewhere a higher price is charged during the lighting periods and a lower price during the rest of the day, requiring time registering devices. A beginning is being made more and more to pass over to a tariff which levies partly a fixed annual charge and partly a variable charge levied as a consumption charge for kilowatt hours consumed.

Some applications of electricity on Swedish farms are described in more or less detail. These include both the use of large, medium, and small motors and the use of electricity for transport.

It is reported that good economic results have been obtained in the electric heating of hotbeds on account of the increasing lack of stable manure in the neighborhood of large cities. The best way for making use of this is by carrying the energy through insulated heating wires placed in the soil of the hotbeds.

Some cost data on typical rural electrification practices are also included.

Machine sheds, H. B. WHITE and M. G. JACOBSON (*Minn. Univ. Agr. Ext. Spec. Bul.* 115 (1927), pp. 12, figs. 9).—Practical information is given on the planning and construction of machine sheds, together with working drawings of typical structures.

Housing farm poultry, R. T. PARKHURST, P. MOORE, and M. R. LEWIS (*Idaho Agr. Col. Ext. Bul.* 42, rev. (1927), pp. 38, figs. 29).—This is a second revision of this bulletin (*E. S. R.*, 53, p. 86).

Poultry housing, O. M. WILBUR (*Maine Agr. Col. Ext. Bul.* 173 (1927), pp. 16, figs. 20).—Practical information on the planning and construction of poultry houses for Maine conditions is presented, together with working drawings and bills of material for typical structures.

Pit and trench silos, R. L. PATTY (*S. Dak. Agr. Col. Ext. Ciro. 264* (1927), pp. 15, figs. 8).—Practical information is given on the planning and construction of pit and trench silos adapted to South Dakota conditions, together with working drawings for typical structures.

The farm water supply and sewage disposal (*Ontario Dept. Agr. Bul. 330* (1927), pp. 83, figs. 66).—A large amount of information is presented on the mechanics and chemistry of farm water supply and sewage disposal systems, with particular reference to conditions encountered in the Province of Ontario.

Experimental bacterial and chemical pollution of wells via ground water, and the factors involved, C. W. STILES, H. R. CROHURST, and G. E. THOMSON (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 147* (1927), pp. IX+168, pls. [4], figs. [58]).—This is a progress report of these studies, including also a Report on the Geology and Ground Water Hydrology of the Experimental Area of the U. S. Public Health Service at Fort Caswell, N. C., by N. D. Stearns.

In studies of the distance to which excretal pollution of soil will travel in sandy soil with slowly moving ground water, bacterial pollution with *Bacillus coli* was recovered from well water in 1,213 samples taken under a most rigid technique at distances varying from 1 to 232 ft. away from the experimental trench in which excretal pollution was placed. Chemical pollution was recovered from well water up to 450 ft. from the same trench. Both uranin and *B. coli* traveled in the direction of the ground water flow, and neither was found in other portions of the experimental field. Wet weather, resulting in high ground water, was conducive to extension of the pollution, whereas dry weather, resulting in low ground water, was inhibitive of the extension and conducive to purification of the ground water.

It was found that *B. coli* tends to localize in the upper blanket at or near the ground water table, and water samples in a given well from this blanket may show heavy *B. coli* pollution, while water samples a few inches lower may be *B. coli* negative. When the ground water falls; *B. coli* tends to filter out into the capillary fringe or into the soil. If the soil remains dry sufficiently long *B. coli* dies. Uranin appeared to float out in a blanket at or parallel and close to the ground water table, and tended to filter out into the capillary fringe and soil. However, it did not seem always to rise with higher ground water. Experimental *B. coli* infection of the ground water had remained alive for 2 years and 8 months when last examined, while uranin remained visible in the ground water for 2 years and 7 months.

The changes of the ground water elevations appeared to be very complex and of at least 4 kinds, namely, (1) the upward trend of the ground water table due to hydraulic pressure upstream, (2) the superposition of new ground water by transit from surface water downward to an old ground water table, (3) a new and higher ground water table due to a flow of new water from upstream over a former ground water table, and (4) a wave flow from upstream over a former ground water table. These movements seem to play an important part in the progression of the pollution, carrying the bacteria along to more distant points.

As pollution traveled it did not appear to expand laterally but appeared to contract to narrower breadth. Under the circumstances it is considered obvious that circular cesspools have a mathematical advantage in this respect over square or oblong pits.

A mathematical analysis of the spread of pollution, as indicated by these results, leads to the conclusion that distance from points of pollution represents the great factor of safety in water supplies.

The purification of skim milk solutions on a lath filter, M. LEVINE, G. W. BURKE, and C. S. LINTON (*Iowa Engin. Expt. Sta. Bul. 81 (1926), pp. 30, figs. 5*).—Studies are reported which showed that a plant for the purification of creamery wastes must be capable of rapidly destroying milk sugar without developing detrimental acidities. Anaerobic methods such as septic or Imhoff tanks are not suitable, whereas aerobic devices such as trickling filters provide the conditions necessary for the rapid oxidation of milk sugar and organic acids.

In experiments with a small lath filter, consisting of 6 tiers of laths, 2 ft. square and 1 ft. deep, with 4-in. spaces between the tiers, various dilutions of skim milk were applied at rates of 1,125,000 and 2,250,000 gal. per acre per day. The removal of solids at the higher rate was 37.1, 51.1, and 56.3 per cent for 0.5, 1, and 1.5 per cent skim milk solutions, respectively. At the lower filtration rate 46.6 and 51.6 per cent of the solids were eliminated from 1 and 1.5 per cent skim milk solutions, respectively. The elimination of solids took place primarily in the upper 3 ft. of filtration. Suspended solids were developed in the second to fourth foot of the filter.

The oxygen-consumed values for the raw wastes were 195, 375, and 716 parts per million for the 0.5, 1, and 1.5 per cent wastes, respectively. The reduction in oxygen-consuming constituents effected was from 75.1 to 87.3 per cent, being generally well over 80 per cent with all of the wastes used. The elimination of oxygen-consuming constituents took place almost entirely in the upper 3 ft. of the filter. At the higher rate of filtration there was a reduction of 76.9, 74.8, and 71.1 per cent of organic nitrogen from the three concentrations of skim milk wastes, respectively, whereas at the lower rate of treatment there was a decrease of 80.5 and 72 per cent organic nitrogen from the 1 and 1.5 per cent solutions, respectively. The effect of increasing the concentration or the rate of application of the waste was to increase the depth of the filter which functioned in the removal and digestion of nitrogenous constituents.

Ammonification was most marked in the upper layers of the filter. With the 0.5 per cent waste applied at the higher rate and with the two other concentrations applied at the lower rate, the ammonia rose to a maximum in the second foot, decreasing rapidly in subsequent depths. Increasing the concentration or the rate of application to the filter for a given concentration of waste resulted in the elimination of the distinct maximum ammonia content.

There was no evidence of nitrite formation in the first foot. With the lower rate employing 1 and 1.5 per cent skim milk solutions and also with the 0.5 per cent solution at the higher rate, the nitrites rose quickly to a maximum in the third to fifth foot and then decreased. Nitrite formation was markedly retarded by increasing the concentration or rate of filtration.

In all instances a distinct reduction in nitrates was observed in the first foot of the filter. Denitrification was most marked with the higher concentrations, and with the higher rate of application the decrease in nitrates was evident down to a depth of 3 ft. After this initial drop the nitrate content rose rapidly as the wastes percolated through the successive depths of the filter. The effect of variations in the rate of filtration on nitrate production was particularly marked.

The stability of the effluents was found to be intimately associated with the nitrate content. High nitrates were accompanied by high stabilities. Applying the waste at the lower rate gave stable effluents with the 1 per cent solution, but not with the 1.5 per cent solution. The effluents were considerably more alkaline than the applied wastes. Anaerobic storage of the raw wastes resulted in distinctly acid reactions.

Proteolysis by bacteria from creamery wastes, M. LEVINE and L. SOPPELAND (*Iowa Engin. Expt. Sta. Bul. 82 (1926)*, pp. 32, figs. 11).—Studies on the effect of air supply, initial reaction, concentrations of milk sugar, and concentrations of various salts on the digestion of gelatin in milk proteins by bacteria isolated from creamery wastes are reported.

The digestion of gelatin was found to be much more rapid in the presence of air. This was equally true for the cultures isolated anaerobically from milk wastes stored in tightly stoppered bottles and for those obtained from skim milk subjected to activated sludge treatment. The results indicate, therefore, that the proteolytic bacteria most frequently encountered in milk wastes find unfavorable conditions in the various anaerobic sewage treatment processes, such as septic and Imhoff tanks.

There was no correlation between change in reaction as determined by titration and that observed by H-ion measurements. Total acidity and alkalinity as ordinarily determined in sewage analysis may therefore be misleading as regards the actual acidity or change in reaction of the waste.

The optimum reaction for proteolysis was neutral or slightly alkaline. Acidities up to pH 6.4 produced no appreciable inhibition under aerobic conditions, but it is thought that under the less favorable anaerobic conditions this acidity will be detrimental. Proteolysis was retarded by higher acidities and frequently stopped if the reaction reached pH 5 to 5.5.

With pure cultures of nonlactose-fermenting, proteolytic bacteria the presence of lactose up to 1 per cent did not affect digestion of gelatin or sodium caseinate, and the reaction remained alkaline. In mixed cultures of these with the lactose-fermenting *Bacterium communior* the acidity rose rapidly, and proteolysis was practically stopped if sufficient lactose was present to permit the development of an acidity of pH 5.5. Under aerobic conditions 0.1 per cent lactose was more than sufficient to bring about this limiting reaction.

There was a very distinct correlation between the valency of the cation and its inhibitory effect on the digestion of gelatin and sodium caseinate. The results are also taken to indicate that milk wastes entering a very hard water sewage will probably cause more voluminous precipitates than in a very soft water sewage.

RURAL ECONOMICS AND SOCIOLOGY

Profitable farming systems for east central South Dakota, C. A. BONNEN and J. B. HURSON (*South Dakota Sta. Bul. 226 (1927)*, pp. 80, figs. 20).—The results are given of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the South Dakota State Department of Agriculture of farm organization and management problems, including farm practices and systems in Kingsbury County, S. Dak., during 1922, 1923, and 1924. The data were obtained by the route method from 26 farms, 14 being included for the 3 years, 6 for 2 years, and 6 for 1 year. Data were obtained showing the man labor, horse work, and materials used in growing crops, and the feed, man labor, horse work, and materials used in producing livestock and livestock products.

The selection of enterprises, cost and utilization of man labor and horse work, crop yields and practices used in growing crops, quality of livestock and livestock growing practices, size of business, and ability of operators are analyzed and discussed. Tables of standard material requirements and yields of crops, feed and labor requirements for livestock, and prices of farm products are presented and comparisons made of the organization, operation, returns, expenses, labor income, hours of labor, and labor force required on actual 160-

240-, and 320-acre farms and on farms of similar sizes organized according to suggested systems.

The Connecticut apple industry, I. G. DAVIS, F. V. WAUGH, and H. MCCARTHY (*Connecticut Storrs Sta. Bul.* 145 (1927), pp. 23-106, figs. 16).—The results are given of a production survey consisting of a tabulation of the 1920 and 1925 United States census data, detailed farm surveys of all commercial orchards in the State, and an intensive survey of every farm in four towns. These results include the geography of the apple industry in the State, the number, age, and variety of trees, orchard practices, and size of orchards.

Based upon data obtained from 50 jobbers, 234 general and 109 chain grocery stores, 129 fruit stores, 27 hotels and restaurants, and 7 hucksters, and including 27 cities of the State, tables are presented showing the origin of jobbers' and retailers' supplies of apples, preference for varieties, size of fruit, color, etc., type and size of container, usual size of sales, and the opinion of local apples. Tables are also given showing for rural districts and small towns and cities and for larger cities the data obtained from 570 consumers' families as to the sources of supply, uses made of apples, units of purchase, frequency of use of apples, preferences as to grading, varieties, color, and other qualities desired.

The competition of western and New York apples and that of other fruits with Connecticut apples and the outlook for the apple industry in the State are discussed.

Swiss cheese, T. A. MARVIN ET AL. (*Washington: U. S. Tariff Comm., 1927, pp. V+63, figs. 7*).—The majority and minority reports of the U. S. Tariff Commission to the President of the United States on the differences in costs of production of Swiss cheese in the United States and Switzerland, and the President's proclamation of June 8, 1927, increasing the duty on cheese of the Emmental type from 5 cts. per pound, but not less than 25 per cent ad valorem, to 7.5 cts. per pound, but not less than 37.5 per cent ad valorem, are included. The cost data both for milk production and cheese manufacture are for the year ended April 30, 1924.

Milk cost studies were made on 202 Wisconsin and 65 Ohio farms, and manufacturing cost data were obtained from 20 cooperative factories in Wisconsin, 6 cooperative and 6 independent factories in Ohio, 2 independent factories in New York, and 1 independent factory in Pennsylvania. The milk cost data for Switzerland were obtained from the records of 84 farms in 5 of the most important cheese-producing cantons, and the manufacturing cost data from 4 cooperative factories in the Canton of Berne. The costs of production of milk were determined for both countries on the "farm basis" or "sales allocation principle" and on the "amount returned to the farmer basis." The costs for the United States were also determined on the "dairy enterprise basis." The three methods of obtaining costs of production, and the methods of determining factory, concentration, and transportation costs, are discussed. The costs of production of cheese were found to be 41.34 and 28.19 cts. per pound, respectively, in the United States and Switzerland on the farm basis, and 34.93 and 28.89 cts., respectively, on the amount returned to the farmer basis.

The science of farm labour: Scientific management and German agriculture (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 15 (1927), No. 3, pp. 379-413*).—This article discusses some of the principles and methods of Taylorism and of scientific management and their application to agriculture. The information presented is based upon a study of existing German literature

on the subject and by a personal visit to the experimental station for the science of farm labor at Pommritz, Germany.

The agricultural credit in Corea, S. KAWADA (*Kyoto Univ. Econ. Rev.*, 2 (1927), No. 1, pp. 89-114).—The organization and functioning of the local credit associations and federations of Chosen, the Industrial Bank of Chosen, and the Oriental Industrial Development Company are described and suggestions made for improving the agricultural credit facilities of that country.

The marketing of primary products, C. C. CRANE (*Agr. Gaz. N. S. Wales*, 38 (1927), No. 8, pp. 585-589).—A brief analysis of the Marketing of Primary Products Act of New South Wales, which became effective in June, 1927.

Market movements of livestock in Ohio, G. F. HENNING (*Ohio Sta. Bul.* 409 (1927), pp. 54, figs. 26).—Tables, maps, and graphs with text discussion are included showing for hogs, cattle, calves, and sheep the number in Ohio on January 1, 1926, the number killed on farms, 1922-1925, by butcher shops, 1925, and sent to terminal markets and direct to packers in 1925, and the average percentages marketed by months in the United States and in Ohio, 1920-1925. The methods of making direct-to-packer shipments are discussed. Tables are given and discussed showing for 1925 the slaughter by Ohio packers in different cities, the percentages of the total number slaughtered and purchased direct from Ohio stockyards and from out-of-State stockyards, the increase in the number slaughtered and the capacity of packing plants, the preferences of packers as to breeds and size of livestock, and the distribution of meats. The effects of dressing percentages, bruised meat, losses from tuberculosis and other causes, filling, and methods of feeding upon prices received for livestock are discussed briefly.

Financial records for country creameries, F. ROBOTKA (*Iowa Sta. Circ.* 106 (1927), pp. 32, pls. 3, figs. 4).—A system of financial records adapted to the needs of country creameries is presented, together with a discussion of the general plan of the system and the operation of each of the several forms.

Crops and Markets, [September, 1927] (*U. S. Dept. Agr., Crops and Markets*, 4 (1927), No. 9, pp. 329-368, figs. 3).—Tables, notes, graphs, and summaries on the usual subjects, covering crops, livestock, agricultural products, prices, and other matters pertaining to agriculture, are included. A table is given showing by cities the number of cattle, calves, hogs, sheep, and goats slaughtered under Federal inspection each year from June 30, 1908, to June 30, 1927.

International yearbook of agricultural statistics, 1926-27 (*Internatl. Inst. Agr. [Rome], Internatl. Yearbook Agr. Statis.*, 1926-27, pp. XXXII+580).—This is a continuation of the series previously noted (*E. S. R.*, 56, p. 790). In this volume the table of contents, introduction, index, and general notes by countries (pp. 565-570) are in English only.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The present status of attempts at improvement of instruction in land-grant colleges, C. D. BOHANNAN (*State College: N. Mex. State Col. Agr.*, 1927, pp. [71]).—This is a mimeographed report of the results of a survey and is based upon data obtained from 46 of the land-grant colleges of the United States. The replies to the questionnaire sent to the several States are summarized by States and also under the following headings: Number of semester hours in education required of candidates for positions, number of years of teaching experience required of candidates for positions, supervision of instruction of new faculty members, the use of faculty committees or discussion groups as a means of improvement of instruction, use of "outside" lecturers or

"experts" in teaching methods to stimulate interest in improving teaching methods, number of faculty members taking courses in education or agricultural education, special assistance on improvement of instruction rendered by departments of education or agricultural education exclusive of regular courses, objections on the part of faculty members to methods adopted for improvement or supervision of instruction, special courses in methods or psychology for faculty members, research on problems of college instruction, and comments on the most effective ways and means of improving collegiate instruction.

A brief discussion of the present status of the problem as indicated by the replies and of the author's own views, and a list of proposed research problems connected with the improvement of college instruction are included.

The case method in the study of teaching with special reference to vocational agriculture, A. W. NOLAN (*Bloomington, Ill.: Pub. School Pub. Co., 1927, pp. XII+266*).—This case book is designed for use in teacher-training classes in vocational agriculture, and furnishes concrete teaching situations in that field illustrating the principles and methods of teaching. Three types of instruction are included, that through classroom exercises, that through farm practice supervision, and that through extension teaching. A control chart for case study, control chart questions and suggestions to guide in the case study of class exercises, a sample report, and 10, 15, or 20 case records are given for each type. The case records for classroom exercises and farm project visitations consist of reports of pupil-teacher conversations, and those for community extension service of records of agricultural extension services carried on by teachers in their respective communities.

A report of the committee on the conduct of extension work in rural sociology, B. L. HUMMEL (*Amer. Sociol. Soc. Pubs., 21 (1927), pp. 254-257*).—The report of this committee at the twenty-first annual meeting of the American Sociological Society, December 28-31, 1926, briefly summarizes the extension work in rural sociology being carried on by the land-grant colleges through the State agricultural extension services, and discusses some of the difficulties and needs in extension work in rural sociology.

Report of committee on research in rural sociology, C. C. TAYLOR (*Amer. Sociol. Soc. Pubs., 21 (1927), pp. 248-253*).—The report of this committee at the twenty-first annual meeting of the American Sociological Society, December 28-31, 1926, considers the conclusions of the committee's 1925 report, the work of the committee during 1926, the present status, needs, and prospects of rural social research, and the proposed steps for meeting the needs.

Development of home economics research at the agricultural experiment stations under the Purnell Act, S. L. SMITH (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas. 1926, pp. 89-96*).—This report includes a brief history of the organization and administration of home economics research at the agricultural experiment stations, a classified list of Purnell projects pertaining to home economics under investigation or completed during 1925-26, and a brief discussion of progress and results.

FOODS—HUMAN NUTRITION

The differential calorimeter, with special reference to the determination of the human metabolism, A. K. NOYONS (*Louvain: René Fonteyn, 1927, pp. 189, figs. 34; rev. in Science, 65 (1927), No. 1688, p. 448*).—This monograph explains in detail the principle, construction, and operation of the differential calorimeter for metabolism determinations, a brief account of one form of which has been noted previously (*E. S. R., 53, p. 315*). The final chapter gives

the results of the use of the calorimeter in the measurement of basal metabolism in a number of pathological cases and a summary of the more important features of the calorimeter. A comparison of the data obtained by means of this calorimeter with various well-known standards has led to the conclusion that the formulas of Harris and Benedict (*E. S. R.*, 41, p. 760) are the most satisfactory for use for persons over 20 years of age. Attention is called particularly to the variable factors influencing the basal metabolism of young girls and to the impossibility of including these in any standard of comparison. In contrast with this is the high constant factor in the formula for adult women.

A review of this monograph by F. G. Benedict summarizes the essential features of the calorimeter and its importance as follows: "This differential calorimeter is unique in that the author, at once a physician, physiologist, and physicist, has combined in it the most scientific and accurate methods applicable to the measurement of the heat given off by a human. The compensation chamber furnishes, for the first time, an exact duplicate of the heat of vaporization of water in that precisely the same amount of water vaporized from the skin and lungs of the human subject is there vaporized, and an electrical current, passed through a suitable resistance, generates precisely that amount of heat given off by radiation, convection, and conduction from the subject."

The type of fuel used in muscular exercise, D. RAPPOET and E. P. RALLI (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 964-966).—In this preliminary report data are summarized on the respiratory quotients of three dogs as affected by mild and severe exercise following normal, high carbohydrate, and high fat diets, respectively. The data indicate that the excess respiratory quotient of exercise and recovery corresponds roughly to the basal respiratory quotient whether the exercise be light or heavy. On the high carbohydrate diet the excess respiratory quotient tended to approach unity, on the normal diet it varied between 0.8 and 0.9, and on the high fat diet it was in the neighborhood of 0.76.

The authors conclude that "in the normal animal the proportion of fat and carbohydrate burned to supply the energy for muscular exercise is a function of the type of diet the animal has been ingesting, and that this holds true not only in severe exercise of long duration but in a very mild exercise of very short duration as well." This is contrary to the conclusion of Furusawa (*E. S. R.*, 54, p. 292) that short-lived muscular exercise is performed only at the expense of carbohydrate.

Seasonal variation in growth of school children, H. EMERSON (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 16, pp. 1326-1330, figs. 9).—Through the cooperation of R. B. Faus of the Royal School at Honolulu, F. D. Bell of the Provincial Health Department at Toronto, and J. C. Gebhart of the Association for Improving the Condition of the Poor in New York, records were obtained of the height, weight, diet, and incidental sicknesses by months for a year for each of 833 school children between the ages of 5 and 10 years.

Of the entire number of children, 168, or 20 per cent, gained weight every month of the year or showed a stationary weight for not more than 1 month. The others showed either an arrest in weight for 2 or more consecutive months or a loss of weight for 1 or more months of the year. Grouped by localities, 110 of the 316 children in Honolulu, 49 of the 374 in Toronto, and 9 of the 143 in New York City, representing 35, 12, and 6 per cent, respectively, of the children in the various localities, belonged in the first group.

The months in which failure to gain or loss in weight was most frequent were January to May, nearly twice as many falling into this group in this period as in the 5 months, July to November. There appeared to be no correla-

tion between failure to gain and dietary habits, but a definite relationship between loss in weight or failure to gain with reported illnesses of an infectious nature.

It is concluded that the seasonal variation in growth of school children as emphasized by various investigators is attributable to the greater incidence during the winter months of infections, particularly those acquired through the respiratory tract. "A child who fails to gain in weight each month, at least up to the age of 10 years, is in all probability suffering from some form of infection or fatigue in which diet, housing, and school attendance may play important contributing parts. Groups of children living under favorable conditions can be found who, in the absence of infections or other sicknesses, exhibit a regular monthly gain in weight regardless of the season of the year."

Utilization of the calcium of spinach, L. McLAUGHLIN (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 455-462).—In this comparison of the calcium balance on diets in which spinach and milk, respectively, furnished a high proportion of the calcium, seven healthy women of the staff of the Bureau of Home Economics, U. S. D. A., served as subjects. The basal diet consisted of round of beef, potatoes, bread made without milk or fat, Grimes Golden apples, butter, and sugar. During the first 6 days of the experimental period proper, milk furnished 79 per cent of the total calcium intake and in the next 6 days spinach and cream were substituted for the milk in amounts estimated to have the same proximate composition as the milk and an equal amount of calcium.

There were no differences shown by the two diets in the length of time required for the appearance of the feces markers or in the percentage of moisture in the feces. The average coefficient of digestibility of the protein of the milk period was 91.9 per cent and that of the spinach period 88.6 per cent. The coefficients of digestibility of the fat were 97.2 and 97.7 per cent, respectively. Although the spinach diet furnished about 2 gm. daily of oxalates computed as oxalic acid, no digestive disturbances were noted.

The minimum, maximum, and average values for calcium retention in the milk period were 0.9, 3.0, and 1.7 mg., and in the spinach period 0, 1.4, and 0.7 mg. per kilogram of body weight. One of the subjects had a higher retention of calcium during the spinach than the milk period.

The distinct positive calcium balance in six out of the seven subjects and calcium equilibrium in the seventh are thought to furnish definite proof of the utilization of the calcium of spinach by adults.

The iron content of animal tissues, C. A. ELVEHJEM and W. H. PETERSON (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 433-441).—For the iron determinations reported, the authors have used either the Thomson method or the modification of this method proposed in an earlier paper (*E. S. R.*, 55, p. 614). Since the modified method is the longer of the two, it has been found advisable to run triplicate analyses by the Thomson method first, adding 1 cc. of a standard iron solution equivalent to 0.1 mg. of Fe to the filtrate of one of the triplicates after the ash has been dissolved in hydrochloric acid and filtered from the insoluble residue. After the analyses have been completed, if there is not more than 5 per cent error in the recovery of iron as determined by subtracting the average of the two samples with no added iron from the one with added iron, the determination is considered satisfactory. If the error is greater, the longer modified procedure is used.

The analyses reported include various tissues of one beef animal and two rabbits, and beef, calf, and hog spleen, liver, and kidney. In general the iron content of the internal organs was found to be higher than that of the other

tissues. Bone marrow, hide, intestines, heart, and muscle were low and the kidney, pancreas, liver, and spleen relatively high in iron, the amount increasing from kidney to spleen in the order mentioned. The figures for rabbit tissues checked fairly well with those of beef tissues, although there were some variations in the iron content of the same tissues of the two animals analyzed. Beef juice prepared in the same way as for infant feeding was very low in iron, containing only 0.0029 per cent Fe.

The average values for beef, calf, and hog spleen were 0.0091, 0.0255, and 0.0294 per cent; for beef, calf, and hog liver 0.0083, 0.0054, and 0.0250 per cent; and for beef and hog kidney 0.0057 and 0.0059 per cent, respectively, of the fresh tissue. These values are considered significant in connection with the dietary treatment of anemia. "From the standpoint of iron content, hog liver is the best type of liver to use in the cure and prevention of anemias. Of course variations in the individual tissues must be recognized, but by using livers from this animal the total average is retained at a high level. In view of the fact that calf liver is lower in iron than the livers of other animals analyzed, it becomes a question whether in infant feeding the livers of animals other than that of the calf should not be considered."

The metabolism of sulfur.—XIII, The effect of elementary sulfur on the growth of the young white rat, G. T. and H. B. LEWIS (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 515-523).—In this continuation of the series of studies previously noted (E. S. R., 57, p. 487), elementary sulfur in the form of powdered flowers of sulfur was found to be incapable of taking the place of cystine in the nutrition of rats on two cystine-deficient diets—the milk powder-starch diet of Sherman and Merrill (E. S. R., 53, p. 562) and the low protein (casein) diet of Osborne and Mendel (E. S. R., 37, p. 864). The sulfur, which was added to the first diet in concentrations of 0.08, 0.50, 0.75, and 1 per cent and to the second at a 1 per cent level only, caused marked retardation of growth in all cases and proved definitely toxic in the Sherman-Merrill diet. When fed to the extent of 1 per cent of this diet, 14 out of the 22 animals died. The toxic effect is thought to be due to the formation of hydrogen sulfide in the intestines.

The fundamental food requirements for the growth of the rat.—I, Growth on a simple diet of purified nutrients, L. S. PALMER and C. KENNEDY (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 591-611, figs. 2).—Various growth experiments on supposedly complete synthetic diets as reported in the literature are reviewed briefly, with comments on details which are considered to detract from the acceptance of the results as having proved that the "growth of the rat is determined by known or at least attainable substances of known existence." The principal sources of error in the work reviewed are thought to be the failure to prevent the rats from having access to their excreta and incomplete purification of some of the constituents of the diets.

The authors' experience along the same line over a period of several years is reviewed in considerable detail. The ration employed consisted of purified casein 18, salt mixture 8.7, agar 2, butterfat 5, and dextrin to 100 parts, the dextrin carrying the alcohol extract of ether-extracted commercial wheat embryo equivalent to 15 parts of the ether-extracted embryo. The preparation of the various ingredients of the ration is described in detail, and the growth curves are given of 16 lots totaling 88 rats fed this presumably complete ration, the experiments covering a total of five consecutive years. The first lot of rats was kept on sawdust, but all of the remaining were kept on raised screens. It is significant that with this first lot growth was satisfactory during the five months of the experiment, while in all of the later experiments there was

uniform failure to grow. The deficiency was characterized by partial but not severe loss of appetite, rough greasy fur, and a generally poor condition, but with no indication of xerophthalmia, polyneuritis, or rickets.

The failure of this ration as compared with the success reported in the literature for similar diets is considered to be the result of one or both of two factors, (1) the use of more highly purified protein, and (2) the suppression of coprophagy, and to indicate that "the requirements for normal growth of rats are not satisfied by a balanced diet made up of generally recognized nutrients when the technique involves a more rigid purification of the protein and a more rigid laboratory procedure in housing the animals."

The effects of synthetic diets on fertility and lactation, E. Tso (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 6, pp. 465-468).—Data accumulated during the past two years in the author's laboratory at Peking Union Medical College and in Mendel's laboratory on the effect of certain synthetic diets on reproduction and lactation are summarized and discussed with reference to contradictory reports in the literature on the existence of vitamin E.

In the author's experience reproduction in rats was not secured on a diet of purified casein 20, cornstarch 41, salts 5, yeast 10, butterfat 9, and lard 15 parts. However, there was repeated reproduction on a diet containing the same proportions of casein, salts, and yeast, but only 5 gm. of butterfat and 1 of lard, with cornstarch increased to make up the 100 per cent. The difference is attributed to the specific action of the lard rather than to the excess of fat per se, since Evans and Bishop (*E. S. R.*, 48, p. 864) have reported successful reproduction with 24 per cent of the diet supplied by butter and Kennedy and Palmer (*E. S. R.*, 55, p. 594) with Crisco in place of lard on the high fat diet.

Lactation was successful only when the diets were supplemented by mixed extracts from the previous purification of the casein, starch, and yeast or by 10 gm. of fresh lettuce daily.

The physiological rôle of vitamin B, III, IV (*Biochem. Jour.*, 21 (1927), No. 3, pp. 632-661, pls. 2, figs. 6).—In continuation of the investigation previously noted (*E. S. R.*, 56, p. 694), two papers are presented.

Part III. *Study of vitamin B deficiency in pigeons*, S. K. Kon and J. C. Drummond (pp. 632-652).—Extensive evidence is reported indicating that in pigeons, as well as in rats, inanition plays an important part in vitamin B deficiency. In order to separate the effects of inanition from those which might be due more directly to the vitamin deficiency itself, each of a group of 8 pigeons was matched as closely as possible in weight and age with another pigeon to serve as control. The first group received a modified artificial vitamin B-free diet of the type used by Randoin and Simonnet. Each of the pigeons of the second group of matched controls was forcibly fed the same quantity of food that the corresponding pigeon had received the previous day plus 1 gm. of yeast extract (marmite).

The records of body weights, food consumption, and, in the later stages of the experiment, body temperature were strikingly similar for corresponding pigeons in the two groups. An initial loss in body weight, attributed to lack of appetite during adjustment to confinement in separate cages, followed by slight gain and then a gradual loss, was characteristic of the pigeons in both groups. At about the beginning of the fourth week there was sometimes a partial but transient recovery of appetite. A progressive fall in body temperature occurred in both groups up to the onset of acute symptoms, when there was a rapid drop in temperature in the 5 pigeons in the first group which developed typical polyneuritic symptoms. Four of these pigeons recovered from the first convulsive seizures without being treated, and with recovery there was a rise in temperature from the low level during the attack.

A suggested explanation of the spontaneous cures which have been noted in this and other investigations as of frequent occurrence is a liberation of the reserves of vitamin B in the tissues during periods when there is none in the diet and when there is considerable tissue wasting. Histological examination by Woollard of pigeons from the two groups showed similar changes in both groups attributable to the wasting resulting from starvation. No relation could be traced between the occurrence of acute nervous symptoms and degenerative changes in the nerves. Examination after a barium meal of the alimentary tract of pigeons from both groups showed no impairment of the motile function even during acute symptoms. In pigeons fed forcibly on a B-deficient diet the well-known failure to empty the crop could not be attributed to decreased peristalsis, for normal peristaltic movement could be seen when the meal finally reached the intestines.

A repetition of the work of Farmer and Redenbaugh (E. S. R., 54, p. 892) failed to confirm their reported findings of a complete loss of amylolytic and decrease of proteolytic enzymes in pigeons on a B-deficient diet, but showed clearly that the digestion of starch is normal.

Part IV. *The relation of certain dietary factors in yeast to growth of rats on diets rich in proteins*, A. Hassan and J. C. Drummond (pp. 653-661).—In this extension of the study noted in the second paper of the series, further tests were made in order to throw some light on the action of yeast in supplementing the high protein diet.

It was first found that the nitrogen metabolism of rats failing to grow on the high protein-low yeast diet was not affected. The addition to this diet of the ash corresponding to the amount of yeast necessary for good growth was without effect, but the addition of 12 parts of autoclaved yeast extract brought about renewed growth. When the entire amount of yeast used was autoclaved no growth took place, but if to this was added 5 mg. of a concentrate prepared from yeast by the Seidell method growth was resumed. The Seidell concentrate alone was without effect.

These results add to the evidence recently reported from various laboratories of the presence of two factors in vitamin B. The authors are of the opinion that it is the heat- and alkali-stable factor which is chiefly concerned in the action of the yeast supplements in rendering high protein diets adequate for growth.

A note on the temporary spontaneous disappearance of typical "beriberi" symptoms in pigeons fed on diets deficient in vitamin B, S. K. Kon (*Biochem. Jour.*, 21 (1927), No. 4, pp. 834-836).—The above-noted experiments of Kon and Drummond in which spontaneous cures of several "beriberi" pigeons on a synthetic vitamin B-free diet were observed, have been repeated on a larger number of birds with similar results.

The experiment lasted 54 days, during which 4 of the 19 birds under observation died without characteristic acute symptoms of vitamin B deficiency. Of the remaining 15, all of which developed unmistakable beriberi symptoms at varying intervals averaging 29 days, 6 died without improving, while spontaneous cures occurred in the remaining 9. Subsidence of the symptoms for a period of less than 48 hours was not considered a cure. A second spontaneous cure was never observed, the birds either dying without marked symptoms some time after the first cure or succumbing to a second attack. As noted previously, the onset of acute symptoms was generally accompanied by a marked drop in temperature and temporary recovery by a corresponding rise. In a control batch of 24 pigeons on polished rice, over 60 per cent developed typical polyneuritic symptoms, and there were no spontaneous cures.

"Whether the known deficiencies of polished rice—insufficient amount of salts and lack of roughage—are to be looked upon as the causative agents of the onset of immediately fatal 'beriberi' symptoms or whether still another factor plays here a rôle can be decided only on the results of further investigations. These experiments clearly demonstrate that a curative test, when pigeons fed on synthetic rations of the type here described are used, might lead to completely erroneous conclusions."

Experiments with Jansen and Donath's antiberiberi-vitamin, C. ELJKMAN (*K. Akad. Wetensch. Amsterdam, Proc.*, 30 (1927), No. 3, pp. 376-382, pls. 2).—Both preventive and curative experiments on pigeons and fowls with some of the antineuritic concentrate prepared by Jansen and Donath (*E. S. R.*, 57, p. 489) are reported. In the author's experience the concentrate in amounts of 2 mg. per kilogram of polished rice is barely sufficient and 4 mg. amply sufficient in long-continued protective experiments. .

It is noted that a 1 per cent solution of the concentrate gives a faint blue color with the Folin-Denis phosphotungstic acid reagent.

Vitamin requirements of nursing young.—I, The unusual response of nursing young (*Mus norvegicus-albinus*) to vitamin B administrations: Preliminary report, B. SURE (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 9, pp. 675, 676).—The increased demand for vitamin B during lactation, as previously noted (*E. S. R.*, 57, p. 897), and the difficulty experienced by the mother in transferring sufficient vitamin B to her milk have been demonstrated as follows:

Female rats are placed on the day of the birth of the young (the litter being reduced to six) on a vitamin B-deficient diet consisting of purified casein 20, agar 2, butterfat 5, McCollum's salt mixture 185.4, and dextrin 69 parts. On such a diet the rats are able to nurse their young successfully for from 10 to 12 days. When the young have stopped growing brewers' yeast is administered quantitatively to the mother. An amount of 1,500 mg. daily of Harris concentrated brewers' yeast has been found necessary to complete the lactation period successfully. If instead of administering all of the vitamin extract to the mother some of it is fed to the young from a medicine dropper smaller amounts are necessary. A highly concentrated preparation of yeast was found to be ineffective when administered to the mother alone in 500-mg. daily doses, but when the mother received 50 mg. and the young 450 mg. daily growth and development of the young were entirely successful.

"It is quite possible that, although beriberi in an accentuated form is seldom encountered in this country in the human baby, a large proportion of the infant mortality during the first year of life which is associated with gastrointestinal disturbances may be due to vitamin B deficiencies. Such vitamin deficiencies may be brought about by the character of the present American diet, which is composed largely of degerminated cereals, sugar, and meat, and, in addition, by the inefficiency of the nursing mother to secrete her daily intake of vitamin B quantitatively and rapidly into the milk, which is indispensable for infant nutrition and welfare."

The antirachitic value of irradiated cholesterol and phytosterol.—VIII, The activation of sterol fractions by ultra-violet irradiation, A. F. HESS and R. J. ANDERSON (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 651-657).—Continuing the studies previously noted (*E. S. R.*, 57, p. 292), the α -, β -, and γ -sitosterols of corn oil prepared by the methods described by Anderson and Shriner (*E. S. R.*, 56, p. 310) were irradiated, dissolved in linseed oil, and fed by pipette in 2.5-mg. doses to rats on a rachitic diet in curative and preventive experiments. The irradiated α -sitosterol, in the preparation of which the bromination method was not used, proved strongly antirachitic, while the irradiated β - and

γ -sitosterols, which had undergone bromination, were without antirachitic properties.

In commenting upon these results, in view of the current belief that ergosterol is the provitamin or precursor of vitamin D, the authors state that "whether traces of ergosterol are present in corn oil is not known, and it can not therefore be definitely stated whether in our experiments ergosterol was the substance extracted and activated. If ergosterol is the sole antirachitic precursor, it is evident that this sterol must be universally present in all fats of animal and of plant origin that are capable of activation by ultra-violet radiations. This is an exceedingly broad conception. Considerable further chemical and biologic investigations will be necessary before it can be decided whether certain sterols other than ergosterol can contribute to the antirachitic activity of irradiated material."

Influence of feeding mixture on the antirachitic potency of cod liver oil concentrate, A. L. DANIELS and L. M. BROOKS (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, pp. 972-974).—Growth curves are reported for four groups of young rats, one group receiving a rachitic ration alone and the others the same ration supplemented by 1 per cent cod-liver oil dissolved in 2 per cent corn oil, a cod-liver oil concentrate equivalent to 1 per cent cod-liver oil dissolved in water and mixed with the ration, and the same concentrate dissolved in 2 per cent corn oil, respectively.

The animals receiving the cod-liver oil and the concentrate mixed with water averaged the same weekly gains, and those receiving the concentrate dissolved in corn oil considerably better gains. It is concluded that the most effective method of administering a cod-liver oil concentrate is to dissolve it in an oil.

Clinical experience with the new antirachitic material of Windaus-Hess [trans. title], G. PRINKE (*Klin. Wchnschr.*, 6 (1927), No. 35, pp. 1644-1647, figs. 3).—This is a brief report of the author's experience in the use of activated ergosterol in the treatment of infantile rickets. In her opinion the curative action is much more rapid than that of cod-liver oil or ultra-violet light treatment. Activated ergosterol is now obtainable in Germany under the trade name Vigantol. This is a 1 per cent oil solution of which 25 drops contain 10 mg. of the active substance. From 10 to 15 drops daily is the customary dose.

Liver diet in anemia (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 16, p. 1355).—A collection of English and French recipes for cooking liver.

TEXTILES AND CLOTHING

X-ray investigations on cellulose, R. O. HERZOG (*Kunstseide*, 8 (1926), Nos. 10, pp. 334-337, figs. 2; 11, pp. 388-390, figs. 3; 12, pp. 431, 432, 434, figs. 4).—Many of the significant statements, presented in both German and English in this article, have been noted earlier from another source (*El. S. R.*, 55, p. 98).

Shape, dimensions, and strength of tubulated (hollow) rayon [trans. title], A. HERZOG (*Kunstseide*, 8 (1926), No. 11, pp. 397-400, figs. 4).—The characteristics of English, German, and French aerated rayons are described from microscopic studies and strength tests. This type of rayon resembled the solid viscose rayon in wet and dry strengths, but slightly surpassed viscose in extension at the breaking point, both wet and dry.

Increasing the stability of moist rayon with formaldehyde [trans. title], W. BRUCKHAUS (*Kunstseide*, 8 (1926), No. 5, pp. 115, 116).—Two methods are outlined by which rather brittle, moist rayon is rendered more resistant to the effects of alkali and water during manufacture. With the formaldehyde treatment, the rayon becomes softer and more elastic, and fewer faults occur.

The effect of acids on rayon [trans. title], K. WOLFGANG (*Kunstseide*, 8 (1926), No. 7, pp. 175-177).—Tests wherein cupramonium, nitro-, and viscose rayons were treated with various strengths of the several acids employed in the refining process revealed the following maximum concentrations permissible to avoid injury to the fiber: Sulfuric acid, 0.03 to 0.05 per cent; formic acid, 0.3; acetic acid, 0.3; and lactic acid, 1 to 1.5 per cent.

[Effect of sea water on sisal and manila ropes] (*Jour. Textile Inst.*, 18 (1927), No. 8, p. P192).—Samples of 3-in. ropes composed of (1) British East African sisal, first quality, (2) same, second quality, and (3) J grade manila hemp showed average breaking strains of 6,740, 8,690, and 7,920 lbs. After 4 months' exposure to sea water the respective percentage losses in strength were 35, 51, and 42; after 6 months', 47, 62, and 51; and after 9 months', 51, 65, and 53 per cent.

HOME MANAGEMENT AND EQUIPMENT

Homemaking as a center for research (*New York: Teachers Col., Columbia Univ., Bur. Pubs.*, 1927, pp. [XI]+122).—This is a report of eight conferences on home making, held at Teachers College, Columbia University, between March 2 and April 20, 1927. The report is an interpretation of the conferences under the following headings: Aim—problem finding, not fact finding; scientific management applied to the home (process, routing, and motion studies); household administration (planning and scheduling); adapting the house to the changing family; socializing the home (community projects); financing the home (budgeting and buying); the personnel of the home (child studies and professional status of women's work); and education for home makers. The program and personnel of the conferences are included in an appendix.

The home management house, edited by E. H. GUNTHER ET AL. (*New York: Teachers Col., Columbia Univ., Bur. Pubs.*, 1927, pp. VI+93, figs. 3).—This is a report of the Home Management House Conference held at Teachers College, Columbia University, March 25 and 26, 1926. The following papers were presented:

The Civic Significance of the Practice House Movement, by J. Ford (pp. 3-6); The Home Management House in Colleges and Other Institutions (pp. 7-11); The Home Management House in Teacher Training Institutions, by M. V. Campbell (pp. 12-16); The Practice Cottage in High Schools (pp. 17-20) (E. S. R., 54, p. 389); Housekeeping Centers in New York City Schools, by M. H. Kittredge (pp. 21-23); The Need for High Standards in Home Management House Architecture and Construction, by B. Halbert (pp. 24-27); Making Construction Function, by B. Pleasants (pp. 32-36); Making Accounts Function, by P. Moody (pp. 37-39); Studies of Housekeeping Activities: Process Charting and Time Studies of Household Operations, by M. Coffin, A. G. Johnson, and E. Wilson (pp. 40-45); Illustrative Study in Fatigue Elimination: Reducing Walking Distances in Dishwashing, by I. Dunne (pp. 45-50); Fatigue in Industry and the Home, by L. H. Gilbreth (pp. 51, 52); Studies of Housekeeping Standards, by M. Rokahr (pp. 53-57); The Child in the Home Management House, by M. C. Nye (pp. 63, 64); Child Clinic Cases and Household Management, by A. G. Johnson (pp. 65, 66); Home and Family Life of the Home Management House, by M. Dinwiddie (pp. 67-73); The Human Element in the Home, by S. M. Sturtevant (pp. 74, 75); The Home Management House Family, by A. G. Spencer (pp. 76, 77); Family Adjustments and a Home Laboratory, by E. P. Howes (pp. 78, 79); "Euthenics," by A. L. MacLeod (pp. 80-82); and Possibilities for Research Through the Home Management House, by A. R. Dyer (pp. 83-85).

There are also included a brief foreword by E. H. Gunther and introductions to the section on the home management house functioning by B. R. Andrews and the section on social factors of the home management house by C. M. Winchell. An appendix includes a bibliography and lists of home management houses in higher institutions, of institutions with school practice houses and home economics cottages, and of some school systems with home apartments or rooms.

Comparative tests of household refrigerating machines, G. B. BRIGHT (*Refrig. Engin.*, 13 (1927), No. 11, pp. 323-352, figs. 19).—The comparative results of the operation of several different types of household refrigerating machines, each one operating in several different types of refrigerators, are reported and discussed.

The data indicate conclusively that each type and size of refrigerator offers a different problem. A wide variety of temperature ranges was noted within three different types of refrigerators, as well as in the same refrigerator with three different types of cooling units of different make and design. This temperature variation was found to be the result of several different points of fundamental design, including the size and arrangement of baffles, air ducts, proportion of width to height, door leakages, and cooling unit clearances in the ice chamber. All of these factors altered the effective static head of air available for setting up circulation within the refrigerator.

In one case impeded circulation introduced so many obstructions to the free flow of air as to necessitate the securing of temperatures as low as from 34 to 36° F. below the cooling chamber in order to get from 48 to 50° on the top shelf of the main food compartment. This stagnation of circulation was found to further materially increase the refrigeration losses through the walls and doors of the cold side of the box required to enable all parts of the main food compartment to be kept at or below 50° throughout.

Attention is drawn to these wide variations of temperature to show the impracticability of taking one, or the mean of even two or three, temperatures within a refrigerator, and calling that the true average as it affects heat transfer, or of taking another temperature out in the room and trying to make accurate use of well-established heat transfer coefficients to determine or account for actual heat losses. Temperatures immediately adjacent to the ordinary domestic refrigerator were found to vary from 10 to 15° on the six sides, even with fan circulation of air in the room.

Service tests on a complete standard make electric household refrigerator and a recommendation for rating such equipment, C. C. SPREEN and L. A. PHILIPP (*Refrig. Engin.*, 13 (1927), No. 12, pp. 355-362, figs. 3).—The data from these tests are presented and discussed, and a new practical method for rating air-cooled household refrigerating machines of various evaporator design is recommended.

MISCELLANEOUS

Report on the agricultural experiment stations, 1926, E. W. ALLEN, W. H. BEAL, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas.*, 1926, pp. 122).—This report contains a discussion of the activities of the stations during the fiscal year ended June 30, 1926, with special reference to those conducted under the Adams Act since its passage, as referred to editorially (*E. S. R.*, 56, p. 701); a résumé (pp. 22-83) entitled *Some Results of Recent Station Work*; two special articles noted elsewhere in this issue; a list classified by subjects of the publications of the stations received during the year; and *Income, Expenditures, and Other Statistics, 1926*, by J. I. Schulte (pp. 113-122).

NOTES

Arizona University.—Dr. H. L. Shantz, for the past year head of the department of botany of the University of Illinois, has been appointed president, effective in September, 1928. Dr. Byron Cummings, acting president since last February, will serve as president during the present academic year.

Maryland University.—The new four-story chemical laboratory, erected at a cost of \$250,000 and furnished and equipped by additional funds contributed by friends of the institution, was dedicated November 26, 1927. Dr. Edgar F. Smith of the University of Pennsylvania was the principal speaker at the dedication exercises. An intersectional meeting of the American Chemical Society for the region was held during the day.

New York State Station.—Dr. D. C. Carpenter, associate in research chemistry, has been granted a year's leave of absence for study in the laboratory of Dr. T. Svedberg at the University of Upsala in an effort to determine the molecular weight of the casein molecule with the aid of Dr. Svedberg's centrifuge. Dr. Carpenter is traveling under the auspices of the International Education Board, and will visit laboratories in Copenhagen, Berlin, Leipzig, Halle, Stuttgart, Munich, and Vienna. Dr. G. J. Hucker, associate in research bacteriology, has returned from 15 months' leave of absence at the Royal Polytechnical Institute at Copenhagen and the Lister Institute at London under the same auspices.

Mrs. Catharine Oaks Cook resigned as librarian December 15, 1927, and has been succeeded by Miss Viola Elver.

Wisconsin University and Station.—Graduate students to the number of 142 were enrolled at the College of Agriculture for the first semester. The regular three-term short course also showed a gratifying increase in enrollment from 100 to 160 students.

A timberland management short course, under the supervision of the College of Agriculture, was successfully conducted in November, 1927. Part of the work was given at Madison and the remainder in the forests in northern Wisconsin, where selective logging operations are in progress. Emphasis was placed on the selective cutting of timber to leave immature trees and thus provide for a continuing crop. Cooperation was given the project by the U. S. D. A. Forest Products Laboratory and other branches of the Forest Service and by the State conservation commission. A number of requests have already been received that the course be repeated next year.

Dr. George S. Wehrwein of the Research Institute of Land Economics and Public Utilities at Northwestern University has been appointed professor of agricultural economics, beginning February 1. He will give his entire attention to research and teaching in the field of land economics.

Dr. G. Bohstedt, chief of animal industry in the Ohio Station, has been appointed professor of animal husbandry and will have general supervision of all research projects in that subject. Rudolph Froker has been appointed extension specialist in cooperative marketing, and Gerald Annin extension specialist in poultry husbandry.

American Society of Agronomy.—This society held its twentieth annual meeting in Chicago, November 17 and 18, 1927. The attendance was large and representative, and the usual comprehensive program was presented including five symposia. The subjects of these symposia were cotton, the soil solution, seed improvement, water relations of plants, and field experiments.

The address of the president, W. L. Burlison of Illinois, was entitled *Meeting Our Responsibility in Agronomic Research*. In this address he pointed out that about one-third of all agricultural research may be regarded as of agronomic interest, representing an annual expenditure of from \$3,000,000 to \$4,000,000. He reviewed the history of agronomic research, and expressed the belief that fundamental studies were still too few in both crops and soils, particularly along such lines as variations and adaptations, the utilization of meteorological data, and studies of storage conditions. Specifically he believed that the aid of the society could best be rendered in the reviewing of the fitness of proposed projects, the stimulation of graduate study, the encouraging of thorough work in the basic problems, and the development of the national resources.

At the business session, the secretary's report brought out the fact that the membership of the society has now reached 767, the largest in the history of the organization, and that the journal of the society, to the editorship of which J. D. Luckett has succeeded R. W. Thatcher, resigned, is in a similarly prosperous condition.

The society voted to sponsor a \$5,000 nitrogen research award provided by the Chilean Nitrate of Soda Educational Bureau. Awards are to be made annually at the meeting of the society by a committee of six appointed by the president to any research workers in the United States or Canada who have performed outstanding nitrogen research in relation to economic crop production. The amount of each award is to be determined by the committee on the basis of the work accomplished as indicated by publications and facilities and funds available for the research project. The awards are to be used in furthering nitrogen investigations or for professional advancement.

Brief reports were presented from the society's many committees, and officers were elected, the list for the ensuing year being as follows: President, A. G. McCall; vice presidents, E. F. Gaines, M. J. Funchess, W. W. Burr, and A. B. Beaumont; and secretary-treasurer, P. E. Brown of Ames, Iowa.

Fourth International Congress of Entomology.—This congress will be held at Cornell University in August, 1928, with Dr. L. O. Howard as honorary president. The tentative program provides for the reading of papers of general interest before all members of the congress each morning, while the afternoons will be available for the five sections as follows: (1) Taxonomy, distribution, and nomenclature, (2) morphology, physiology, and genetics, (3) ecology, (4) medical and veterinary entomology, and (5) economic entomology, with subdivisions of forest, fruit, vegetable, and cereal insects, bees, insecticides, and appliances.

One day, August 15, is to be spent on the New York State Station grounds at Geneva in conjunction with the summer meeting of the New York State Horticultural Society. Numerous excursions are also planned to other nearby points of entomological interest and longer trips at the end of the congress to Niagara Falls, entomological museums of eastern cities, and the laboratories of the U. S. D. A. Bureau of Entomology devoted to the study of the gipsy and brown-tail moths, the European corn borer, and the Japanese beetle.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Principles of chemical engineering, W. H. WALKER, W. K. LEWIS, and W. H. MoADAMS (*New York and London: McGraw-Hill Book Co., 1927, 2. ed., pp. XI+770, pl. 1, figs. 195*).—This text and reference book has as its principal aim "to stimulate engineers to design apparatus . . . rather than just to build it and then to rely on large scale experimentation with expensive changes in construction to effect efficient operation," combining for this purpose mathematical analysis of the theoretical principles with descriptions of standard equipment and practice. The book may be divided roughly into five sections, the first reviewing the principles of stoichiometry and indicating means of applying them to engineering calculations, the second covering the phenomena and laws of the flow of heat and of fluids, the third dealing with fuels and their efficient combustion, while in the fourth and fifth sections the groups of crushing, grinding, mechanical separation, and filtration methods, and of processes dependent upon vaporization are considered. To the present edition two new chapters, one on the principles of diffusional processes and the other on standard operating methods and equipment, have been added.

The industrial chemistry of the fats and waxes, T. P. HILDITCH (*London: Baillière, Tindall & Cox, 1927, pp. XV+461*).—This book is one of a set, *Industrial Chemistry*, designed to constitute ultimately a comprehensive series of surveys of the chemical industries. The present volume follows the general scheme of the series in being designed as both textbook and reference work, its specific aim being the presentation of an introduction to the chemical technology of fats and waxes, and "to survey the whole of the outlets for fats and waxes with due regard to perspective, and to emphasize throughout the connection between the chemical constitution of the raw material and the particular economic application in view.

The subject is arranged in 10 sections, as follows, each section concluding with a brief bibliography: The chemical nature of fats (pp. 1-78); the composition of fats occurring in nature (pp. 79-154); the transformation of fats for industrial use (pp. 155-239); the edible fat industry (pp. 240-281); the soap industry (pp. 282-337); the use of fats in candles and illuminants (pp. 338-350); the production of glycerin from fats (pp. 351-385); the use of fats and waxes in paints, varnishes, and other surface coverings (pp. 386-419); the application of fats to fibers (pp. 420-440); and fatty lubricants (pp. 441-447).

Salts of alpha linolic tetrabromide (sodium, potassium, zinc, barium, calcium, and strontium) from Philippine lumbang oil, A. T. ORETA and

A. P. West (*Philippine Jour. Sci.*, 33 (1927), No. 2, pp. 169-176).—In view of the importance of the various linolic glycerides in the drying properties of lumbang and other oils, the author believes a further study of linolic acid derivatives to be of considerable importance. The tetrabromide of α -linolic acid is a crystallizable, stable compound, in the form of which α -linolic acid may be isolated from oils, and it is, therefore, in the author's belief, an important substance in the chemistry of vegetable drying oils.

The sodium and potassium salts described in this paper were obtained by treating alcoholic solutions of α -linolic tetrabromide (melting point 112.3 to 114.3° C.) prepared from lumbang oil, the zinc, barium, calcium, and strontium salts having been made from the potassium compound. Attempts to determine the melting points of these salts resulted mostly in decomposition without fusion. The qualitative solubilities of the salts mentioned in 17 solvents are tabulated.

Some useful matters contained in forest trees in Japan, I. MIURA (*Jow. Col. Agr., Imp. Univ. Tokyo*, 9 (1927), No. 2, pp. 85-100).—This is a rather exhaustive report on substances of value in the chemical industries and obtainable from Japanese forest trees.

In part 1, on the fatty oils of the seeds of various forest trees found in Japan, the percentages of crude fat extracted from the powdered seeds of 44 species by treatment with ether or mixtures of the powdered material with anhydrous copper sulfate, sand, and sodium sulfate are reported in the form of a table showing the genus and species, the Japanese name, and the English name, if any, for the same genus, as well as the percentages of crude fat in the whole dried, ground seed, and in the endosperm. A second table gives the yield secured by pressing at ordinary temperatures from the seeds of the 8 species showing the highest total crude fat in the first series of experiments, together with the specific gravity, acid value, saponification value, Wijs iodine number, and ester value, refractive index, and Reichert-Meissl value, acetyl value, and percentage of unsaponifiable matter.

Part 2 presents a study of the oil product of 4 species of tung oil trees (*Aleurites cordata*, the aburagiri, or Japanese tung oil tree; *A. fordii*, the Shina-aburagiri, or Chinese tung oil tree; *A. montana*, the Kwangtung-aburagiri, or Kwangtung tung oil tree; and *A. moluccana*, the kukuinoki or tropical tung oil tree) grown in Japan. In addition to the data given for the oils, noted in table 2, table 3 shows, for the four types of tung oil, the percentage found in the whole seeds and in the endosperm, and the time required for drying at 95° C.

Part 3 deals in a similarly thorough manner with the tannins of a large number of species, table 4 showing the total tannin as determined by an exhaustive method and by colorimetric estimation in 101 samples of various parts of 78 species and varieties, together with the type of tannin found in each case, while table 5 gives the tannin content as determined by the hide-powder method, and by oxidation of nontannin extract, and the reducing sugar in the extract of 11 materials from 10 species and varieties selected from those of table 4 as worthy of this special study.

Part 4 reports, in tables 6 to 8, inclusive, the methoxyl content of the wood of the principal forest trees of Japan, the crude fractions obtained in the dry distillation of some of these woods, the percentages of methyl alcohol and of acetic acid recovered, and the results of adding catalysts in the dry distillation of the sawdust of a fir (*Abies sachalinensis*). Ammonium carbonate, the most efficient catalyst, increased the methyl alcohol to a little more than one and two-thirds times the yield obtained in a blank distillation of the wood alone.

Part 5 discusses the cultivation of Cinchona in Formosa, and shows the percentages of total alkaloids found in the roots, trunks, branches, and leaves

of *C. ledgeriana*, *C. hybrida*, and *C. succirubra* grown at 3,600 ft. and at 2,800 ft. above sea level. Part 6 is concerned with the needle oils of 26 Japanese conifers, presenting in table 12 the yields, specific gravity, and rotatory power of oils from all these species, and in table 13 a considerable number of analytical data with respect to the oils of the twigs and leaves of *A. sachalinensis*, *Picea ufjensis*, *P. glehnii*, and *Podocarpus macrophylla*.

On the preparation and the properties of the vegetable decolorizing carbons, I. MIURA (*Jour. Col. Agr., Imp. Univ. Tokyo*, 9 (1927), No. 2, pp. 101-118, fig. 1).—This paper presents a systematic study of the preparation of decolorizing carbons from the sawdust of the Japanese cedar or sugi (*Cryptomeria japonica*), from the ground wood pulp and sulfite wood pulp of the Japanese spruce or yezomatsu (*Picea jezoensis*) and the Japanese fir or todomatau (*Abies sachalinensis*), from the alga kajime (*Ecklonia cava*), from birch bark, and from camellia oil cake. Among the compounds added to the organic material before carbonization were calcium acetate 1, 5, 10, or 20 parts per 100 of sawdust; slaked lime 10, 20, 50, or 100 parts per 100 of sawdust; calcium chloride 10 or 50 parts; calcium bisulfite 50; crude magnesium chloride 10, 50, or 100; sodium chloride 50 or 100; potassium carbonate 50; sodium carbonate 50; sodium bicarbonate 50; copper sulfate 50; alum 50; etc. The products were rated according to the percentage of color removed from a standard color solution by a definite proportion of the carbon under fixed conditions.

It was found in part that of all the substances added before carbonization, calcium compounds were most effective in improving the quality of the resulting carbon, slaked lime, or calcium bisulfite followed by slaked lime, giving the best products. The washing out of the ash constituents with water, alkalis, or acids after carbonization was necessary for the highest effectiveness. The presence of alkali metal compounds during charring was found useless or even deleterious, causing fusion of the ash in the charring process.

"The decolorizing effect of an animal charcoal of best quality is about 3.6 times that of ordinary wood charcoal, and a carbon prepared by submitting sawdust of sugi mixed with slaked lime to dry distillation after treating it with calcium bisulfite has a decolorizing power ca. 13.5 times that of animal charcoal of best quality. A carbon of high efficiency generally passes the filter paper with difficulty, consequently it can easily be filtered off from the solution."

A more or less detailed discussion of the theory of decolorization by carbons is included in the paper.

Some nitrogenous constituents of corn pollen, C. G. VINSON, (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 3, pp. 261-278).—This contribution from the division of agricultural biochemistry of the University of Minnesota reports a study of nitrogen compounds not precipitable on neutralizing the alkali extract of corn pollen, together with some notes on the quantities of nitrogen originally present and extractable by other solvents.

The air-dry pollen, which contained 3.97 per cent of moisture and 3.6 per cent of nitrogen, yielded on successive extraction with distilled water, 5 per cent potassium sulfate solution, dilute sulfuric acid, and dilute alkali, nitrogen equivalent to 2.49 per cent of the pollen, 1.11 per cent remaining unextracted by these solvents. A substance showing the properties of a glutelin, containing 24.96 per cent of the total nitrogen of the air-dry pollen and constituting 9.9 per cent of the materials from which it was extracted, was isolated from the alkaline extract.

The filtrate from the glutelin fraction, after extraction with ether, was hydrolyzed, and the following substances were determined: Adenine, isolated as the picrate, of which 0.985 gm. containing 0.199 gm. of nitrogen was obtained;

arginine nitrogen, 0.156 gm., determined by Van Slyke's method (E. S. R., 26, p. 22); lysine isolated as the picrate, of which 3.241 gm. were obtained; tyrosine, of which 0.1129 gm. was isolated; β hydroxyl glutamic acid, isolated as 31.369 gm. of the copper salt; and choline in the form of chloroplatinate, 0.608 gm. of choline nitrogen being contained in 13.379 gm. of the platinum compound.

In addition to these nitrogen compounds, 0.069 gm. of a compound believed to be a flavone or flavonol was isolated. This was obtained from 36.453 gm. of a crystalline substance of metallic luster, precipitated on acidifying with acetic acid the filtrate from the Neuberg and Kerb procedure (E. S. R., 27, p. 713) for amino acid precipitation. The precipitated mercury compound contained neither nitrogen nor sulfur and was believed to be the mercury salt of the flavonol above mentioned.

The production of certain enzymes by *Bacterium pruni*, S. L. JORDIN (*Jour. Agr. Research* [U. S.], 35 (1927), No. 3, pp. 219-221).—The apparent identification by melting point determinations and qualitative tests of tyrosine, leucine, and a mixture of the higher fatty acids in a deposit formed during the growth of *B. pruni* in pure culture in skim milk is considered evidence of the production of proteolytic and lipolytic enzymes by the organism in question.

The use of electrolytic bridge for determining soluble salts, R. O. E. DAVIS (*U. S. Dept. Agr., Dept. Circ.* 423 (1927), pp. 14, figs. 3).—This bulletin describes the Bureau of Soils modification of the Wheatstone bridge, previously noted (E. S. R., 11, p. 325), and contains detailed directions for the operation of the instrument, notes on its limitations, care, and testing, and tables (1) for the conversion of resistances at any temperature of observation to resistances at 60° F., (2) resistances and salt content of materials containing sulfate and chloride, (3) mixed-salt content of soils with given resistances, (4) resistances of materials containing carbonate, (5) the carbonate content of soils with given resistances, and (6) soluble salts in solutions at 60° as related to resistances at that temperature.

Substitution of sodium compounds for potassium compounds, A. R. SMITH and F. C. VILBRANDT (*Jour. Elisha Mitchell Sci. Soc.*, 42 (1926), No. 1-2, pp. 118-121).—Noting the paucity of our national potash supplies, the authors suggest the advisability of using sodium compounds to replace those of potassium wherever possible, and, with respect to chemical analysis, present the results of 200 determinations made by methods in common use save that potassium compounds were replaced by sodium salts of the same anion. No failure to obtain satisfactory results is reported as due to the substitution. A large number of analytical reagents involved in a wide variety of operations and in which sodium compounds were found as satisfactory as those of potassium is listed.

On the applicability to water analysis of the benzidine method for the determination of sulfuric acid [trans. title], L. W. HAASE (*Chem. Ztg.*, 51 (1927), No. 66, pp. 637, 638).—A comparative study of the determination of sulfate as barium sulfate and by the benzidine method indicated that in the presence of well over 100 mg. of the sulfate radical per liter, the benzidine was the more convenient method and accurate enough for most purposes, but that sulfates in the quantities commonly found in drinking waters are not at all accurately determined by the benzidine method. In 6 determinations on water containing from 55.6 to 78.7 mg. of sulfate per liter the benzidine results averaged 11.4 per cent lower than the results of the determination as barium sulfate, and in 10 samples found by the barium sulfate procedure to contain from 19.4 to 47.8 mg. per liter the benzidine results averaged 51.5 per cent lower.

METEOROLOGY

Monthly Weather Review, [July–August, 1927] (*U. S. Mo. Weather Rev.*, 55 (1927), Nos. 7, pp. 293–348, pls. 6, figs. 29; 8, pp. 349–385, pls. 14, figs. 17).—In addition to detailed summaries of meteorological and climatological data and weather conditions for July and August, 1927, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 7.—International Aerological Soundings at Royal Center, Ind., May, 1926, Part I, Introduction, by W. R. Gregg, Part II, Instruments and Technique, by S. P. Fergusson, Part III, The Results of the Ascensions (illus.), by L. T. Samuels; Monthly Charts of Frequency-Resultant Winds in the United States (illus.), by E. R. Miller; The Dependence of Coastal Sea Temperatures of Cape Cod on the Weather (illus.), by F. Y. Tripp; The Climatic Regions of North America (illus.), by W. Van Royen (see below); Ten Years of Evaporation in the Southwest, by C. E. Linney; Hourly Rainfall Probabilities at Sault Ste. Marie, Mich. (illus.), by C. L. Ray; Water-Level Movements as an Indicator of Forest-Fire Weather, by D. G. Thompson; and Tornadoes in Kansas, July 16, 1927, by P. Connor and B. R. Laskowski.

No. 8.—Abnormal Summers in the United States (illus.), by A. J. Henry (see below); The Protection of Strawberries from Frost Through Artificial Heating (illus.), by A. W. Cook (see p. 206); Some Recent Treasures of the Snow (illus.), by W. A. Bentley; C. E. P. Brooks on the Effect of Fluctuations of the Gulf Stream on the Distribution of Pressure (illus.), by A. J. Henry; Improved Water-Flow Pyrheliometer (illus.), by W. M. Shulgin; Analysis of the Precipitation of Rain and Snow at Mount Vernon, Iowa, by R. W. Hendricks; and On the Unit of Radiation Used in Meteorological Treatises on Actinometry, by A. Ångström.

Climatological data for the United States by sections, [May–June, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 14 (1927), Nos. 5, pp. [202], pls. 4, figs. 4; 6, pp. [194], pls. 4, fig. 1).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1927.

The climatic regions of North America, W. VAN ROYEN (*U. S. Mo. Weather Rev.*, 55 (1927), No. 7, pp. 315–319, figs. 2).—This article reports the results of an attempt to apply Köppen's principles to data of the U. S. Weather Bureau and the Canadian Meteorological Service, as well as supplemental observations on vegetation, for eastern North America north of the Rio Grande.

Abnormal summers in the United States, A. J. HENRY (*U. S. Mo. Weather Rev.*, 55 (1927), No. 8, pp. 349–353, fig. 1).—This paper presents the known facts concerning the severity of the summer of 1816, and attempts "to allocate the summers of 1926 and 1927 to their proper rank among the summers of the nineteenth century."

The summer of 1926 is stated to have been "an average one, without distinguishing features of note. The summer of 1927, on the other hand, was out of the ordinary run of summers, and by summer is meant the months of June, July, and August. June, 1927, was cool in the north and warm in the south about in the proportion, areas considered, of 1 to 1; July was close to normal, being slightly below in some areas and above in others. August, due to an excess of cloudiness causing low day temperatures, had a monthly mean that for a large part of the Northern and Central States east of the Rocky Mountains must be classed as one of the coolest months of the name in the last fifty-odd years."

The effect of heavy rains and resulting floods of the early months of 1927 is stated to have been equal to if not greater than that of deficient temperature in June and August. The common belief that any extreme in temperature or other meteorological element is likely to be followed by one of an opposite character was confirmed by this study, and it is pointed out that the cool summer of 1927, following the series of warm summers from 1919 to 1926, inclusive, conformed to a precedent established by centuries of observations. This tendency of one extreme to be followed by another of opposite character, however, in the opinion of the author affords little to encourage the belief that the tendency can be used in seasonal forecasting.

The protection of strawberries from frost through artificial heating, A. W. COOK (*U. S. Mo. Weather Rev.*, 55 (1927), No. 8, pp. 354-357, pls. 2, figs. 3).—The results of experiments conducted in the Yakima Valley of Washington are stated to prove that "strawberries and other low-lying ground crops can be protected from frost injury by methods of artificial heating. The chief consideration is the cost of the heating operation in comparison with the net returns from the crop."

SOILS—FERTILIZERS

[Soils of Ogle and Logan Counties, Illinois], R. S. SMITH ET AL. (*Illinois Sta. Soil Rpts.* 38 (1927), pp. [2]+60, pls. 3, figs. 6; 39 (1927), pp. [2]+56, pls. 2, figs. 3).—These two surveys deal, respectively, with the soils of Ogle County, about 754 square miles in northwestern Illinois, and of Logan County, about 616 square miles in the central part of the State. The topography of Ogle County varies from flat to rolling, with rough and broken areas along certain of the streams; while in Logan County a topography of similar variation is found, the land lying in general favorable for good drainage, even the flat-lying areas having sufficient undulation so that drainage may be provided without difficulty. The groups of upland prairie, upland timber, terrace, and of swamp and bottom land soils were found in both counties, together with a small miscellaneous group, including sand or gravel pit, rock quarry, and water. In Ogle County there is recognized also a group of residual soils.

Series are not set up in the classification of these soils, but, including deep peat and dune sand as types, 19 types in Ogle County and 17 types in Logan County were examined, mapped, and described. The largest areas in Ogle County are those of the upland prairie brown silt loam, which covers 50.91 per cent of the entire county, and of upland timber yellow-gray silt loam, amounting to 15.70 per cent, while in Logan County 59.97 per cent of the total area is occupied by upland prairie brown silt loam and 13.57 per cent by black clay loam, of the same group.

The reports contain the usual plant-food invoices for the various soils mapped and described; geological information; notes on soil-improvement practice; experiment field data, etc.

Soil survey of Iowa.—Reports 47-49, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts.* 47 (1927), pp. 59, pl. 1, figs. 12; 48, pp. 71, pl. 1, figs. 8; 49, pp. 75, pl. 1, figs. 8).—These reports, dealing with the soils of Grundy, Floyd, and Worth Counties, map and classify the soils of areas amounting, respectively, to 320,640, 316,800, and 255,360 acres situated in the northeastern quarter of the State. The groups of drift, terrace, and swamp and bottom land soils are found in all three counties, Floyd and Grundy Counties having also a group of loess soils, and Worth County a group of residual soils. In topography the three counties are somewhat similar, a flat to undulating or gently rolling surface being found throughout most of

their combined area. The western part of Worth County, however, ranges from flat or gently rolling to strongly rolling or sloping country.

The more important classification data given for each county are as follows: In Grundy County 10 soil series were found and subdivided into 11 types, the largest areas of single soils being those of Carrington silt loam in the drift soil group, 23.8 per cent of the total area of the county; Tama silt loam in the loess group, 46.8 per cent; and Wabash silt loam in the swamp and bottom land group, 12.1 per cent. In Floyd County Carrington silt loam covers the largest area, including 51.0 per cent of the total for the county. Clyde silt loam, also in the drift soils group, follows with 14.2 per cent, the remainder of the 23 types of the 15 series found being distributed in relatively small percentages. Worth County has, in this classification, 18 series and 24 types, the notable percentages being all in the drift soils group, including Carrington silt loam, 22.8; Carrington loam, 21.4; and Clarion loam, 14.0.

Soil survey of Genesee County, New York, H. G. LEWIS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1595-1648, pls. 4, fig. 1, map 1*).—Genesee County, including an area of 317,440 acres in northwestern New York State, has a topography ranging from flat lowland along the northern boundary, more than one-half of which is so flat as to consist of fresh-water marsh, through a belt of gently rolling country to smooth but relatively steep slopes in the southern part, with a maximum elevation in this section reaching 1,460 ft. The larger part of the county is drained through Tonawanda Creek into the Niagara River, and the entire drainage goes ultimately to Lake Ontario.

In the present survey of this area, conducted in cooperation with the New York State College of Agriculture, 24 series of soils were determined and subdivided into the 38 types here mapped and described, together with small unclassified areas of muck, rough broken land, and quarries. The most extensive single type is Honeoye loam, which covers 17.0 per cent of the county.

The application of viscosimetry to the study of colloidal clay [trans. title], A. DEMOLON and G. BARBIER (*Compt. Rend. Acad. Sci. [Paris], 185 (1927), No. 10, pp. 542-545*).—Prefacing this brief report with the warning that in viscosimetric technique the results have only relative significance, since (1) the values are liable to large variation and the samples themselves to marked differences in reactivity toward electrolytes on account of the differences in degree of dispersion and in the nature of the absorbed cations, and (2) it is not possible to attribute to viscosity measurements on clay suspensions the same significance that these figures possess for pure liquids, since clay suspensions are not subject to Poiseuille's law and the values observed decrease with an increase in the diameter of the capillary tubes used in determining them, the author still considers that, these limitations being kept in mind, measurements of viscosity permit the determination of changes in the study of clay suspensions, especially those brought about by the addition of electrolytes.

Experimental results are then presented showing that the viscosity increases hyperbolically with respect to the increasing concentration, with a very rapid acceleration from about 55 gm. per liter. The increased viscosity, which may be considerable, brought about by the addition of electrolytes decreases with successive passages through the capillary tube, and by two hours of mechanical agitation the acquired viscosity may be almost entirely removed, a result which is interpreted as showing that the electrolyte effect is that simply of augmenting the rigidity of the suspension. The permeability of the coagula increases continuously with the concentration of the electrolyte, a parallel increase of the

permeability and the time of outflow of the suspension from the viscosimeter tube having been observed.

Soil temperature studies with cotton.—I, Apparatus for the control of soil temperature for experimental purposes, A. F. CAMP and M. N. WALKER (*Florida Sta. Bul.* 189 (1927), pp. 1-16, figs. 4).—A constant temperature soil tank apparatus is described and figured. The device as actually constructed at the station includes eight soil tanks, each containing eight pots, a thermostatically controlled brine pump, and a thermostatically controlled heater. A series of eight soil temperatures covering practically any range from 0 to 50° C. could easily be secured under the climatic conditions commonly obtaining at this station. The apparatus is based on the internally balanced system employed by Livingston and Fawcett (*E. S. R.*, 45, p. 526), which is believed to be more economical than the single unit type.

The results of microbiological analysis of moor soils.—I, Quantitative account of bacteria [trans. title], D. A. BEGAK (*Pochvovedenie (Pédologie)*, n. ser., 21 (1926), No. 2, pp. 64-75, figs. 2; *Eng. abs.*, p. 75).—From the author's English summary it appears that a study was made of bacterial numbers in the various horizons of an upland moor soil, also called "Gálitsky moss."

The use of the plate method with standard beef extract peptone agar indicated that, though there was much variation, the bacterial numbers were in general small, the superficial horizons, living and dead moss, appearing especially poor in bacterial flora. The bog moss itself was found almost sterile when the plate method was used, practically all the bacteria discovered being in the bog water.

A later investigation, however, in which methods of S. Winogradsky¹ were used, showed the surface horizon to possess a rich bacterial flora, the organisms being found mainly within the hyaline cells of the leaves of the Sphagnaceae. The bacterial numbers per gram in a moist material when determined in this way ran into the hundreds of millions. These bacteria, with certain fungi, are considered to play a very important part in the formation of peat soils. The acidity was high, the pH values ranging from 3.3 to 4.2.

New water molds from the soil, W. C. COKER and H. H. BRAXTON (*Jour. Elisha Mitchell Sci. Soc.*, 42 (1926), No. 1-2, pp. 139-149, pls. 6).—This contribution from the University of North Carolina describes and illustrates a number of new forms of several genera of water molds and some known species isolated for the first time from soil. The new forms, each grown in pure culture from a single spore, are as follows: *Allomyces moniliformis* n. sp., *Thraustothecae unisperma* n. sp., *T. unisperma litoralis* n. var., *Achlya subterranea* n. sp., *A. abortiva*, n. sp., *A. caroliniana* (form with antheridia), and *Dictyuchus* sp. (a homothallic strain). Since the earlier publication of J. V. Harvey,² a considerable number of previously observed forms, a list of which is appended to this paper, have again been found in the soil or on living bryophytes in Chapel Hill.

Soil sterilization for seedbeds and greenhouses, W. G. SACKETT (*Colorado Sta. Bul.* 321 (1927), pp. 24, figs. 16).—Sterilization by live steam is discussed as satisfying the requirements of gardeners and greenhouse men for a method which is cheap, practicable, and efficient, two procedures being described in detail.

The first, or perforated pipe method, consists essentially in steaming from 2-in. pipes buried 10 in. deep and spaced, for a bed of 400 sq. ft., 2 ft. apart, the

¹Ann. Inst. Pasteur, 89 (1925), No. 4, pp. 299-354.

²Jour. Elisha Mitchell Sci. Soc., 41 (1925), No. 1-2, pp. 151-164, pls. 8.

pipes being provided with rows of $\frac{1}{8}$ -in. holes spaced at 6 in. along the bottom of the pipe and with lateral rows similarly spaced, but staggered with respect to the bottom row, and drilled on both sides of the pipe a little below the horizontal diameter. The pipes are capped at one end, and provided at the other end, through reducing elbows, with 1-in. valves and hose nipples for connection with a header by means of pieces of 1-in. steam hose. The soil having been replaced over the pipes and thoroughly spaded between the trenches, the sterilization is carried out, with the use of 30 lbs. steam pressure, by first blowing out the condensed water from the header through a blow-out valve provided for that purpose, all the valves leading into the beds being closed, after which the blow-out is closed and the distributor valves are opened one at a time, beginning with that farthest from the boiler end of the header. The soil should be covered with a heavy canvas throughout the operation and for 24 hours afterwards. A dense cloud of vapor is visible above the bed in $\frac{1}{2}$ hour, but from 3 to $3\frac{1}{2}$ hours were found necessary to secure sterilizing temperature throughout the bed, a temperature of about 203° F. being found at the end of the specified period in any part of the bed.

Precautions against reinfection are discussed in some detail, together with experiments in which, after the sterilization of a soil known to contain *Fusarium* infection and nematodes, 206 cucumber plants and 1,977 tomato plants were grown and the crop harvested without the appearance of any evidence of *Fusarium* infection during growth or the discovery of a trace of nematode root gall where the soil had been heated to 200° . A suggested cheaper form of the perforated pipe process is also outlined.

The second, or inverted-pan method, consists in applying the steam through wooden pans, 6 ft. wide, 12 ft. long, and 4 in. deep, the 72 sq. ft. thus covered being as much as it is considered can be properly treated with a 20- to 25-h. p boiler giving 80 lbs. steam pressure. Directions for the construction of the necessary apparatus and for applying this method, which is considered suitable for out-of-door seed beds where but 4 to 6 in. of surface soil need be sterilized, are given.

Ammonifying bacteria appear not to be affected by the steaming, but nitrogen-fixing and nitrifying bacteria are destroyed. It is recommended that all fertilizer for 3 months after sterilization be in readily available, water-soluble form.

The stimulation of plant response on the raw peat soils of the Florida Everglades through the use of copper sulphate and other chemicals, R. V. ALLISON, O. C. BRYAN, and J. H. HUNTER (*Florida Sta. Bul. 190 (1927), pp. 33-80, figs. 21*).—On freshly broken saw-grass peat, an extensive series of plats of which have been recently laid out at the Everglades substation, it has been found, as with other peat soils immediately after drainage, that very poor to almost no growth is obtained when no special treatment is applied. Though this failure of peat soils to support normal plant growth was at first attributed to a number of such causes as the lack of aerobic soil organisms, phosphorus or potash needs, toxic organic compounds, unfavorable reaction, toxic salts, or pathogenic organisms, investigations preliminary to the main series described in this bulletin appeared to show that the failure could not be positively associated with any of these factors.

It was noted, however, in certain experiments in which a Bordeaux arsenic mixture was applied for the control of insects that the corn and cowpeas dusted with this mixture were growing well two weeks after treatment, while the untreated plants were dead. Copper was suspected of being the stimulating agent; and plants were treated with the sulfates of copper, aluminum, zinc, and manganese, and with sulfur, boric acid, and sulfuric acid. Positive response to

the copper treatment (30 lbs. of the sulfate per acre) was very marked, while the zinc and sulfur treatments appeared to show some beneficial effect.

The work was then extended to about 60 crop plants and the series of treatments to include compounds of antimony, barium, boron, copper, calcium as oxide and as slaked lime, mercury, nickel, manganese, arsenic, tin, sulfur as flowers of sulfur, chromium, lead, and zinc. The responses were found most marked in the plats treated with copper, manganese, caustic lime, or manure. In the cases where responses to some of the other chemicals were noted, the stimulation was not of sufficient duration to bring about normal growth, and "when these responses began to fail the plants had the appearance of positive injury." It is suggested, however, that as the responses of at least the leguminous plants to zinc, nickel, etc., commonly appeared much earlier than the copper effects, though they were not able to carry the plants to maturity, the successive nature of these effects might make it possible to obtain still further increments through the application of combinations of such special elements. Preliminary experiments already made in support of this hypothesis are mentioned.

Residual effects with some of the treatments, particularly that with copper, have been noted, and the need for studies of the continued use of such materials is pointed out.

Manganese deficiency in soils and fertilizers, O. SCHREINER and P. R. DAWSON (*Indus. and Engin. Chem.*, 19 (1927), No. 3, pp. 400-404, figs. 2).—Citing the work of McHargue (*E. S. R.*, 41, p. 521) and of a number of other investigators as showing (1) the place of traces of manganese salts among the essential plant nutrients, and (2) the necessity for the neutralization of any excess acidity to give opportunity to the manganese salts to become effective, this contribution from the U. S. D. A. Bureau of Plant Industry presents experiments on a highly calcareous, slightly alkaline soil of low manganese content occurring in the glades of Dade County, Florida. This soil had failed, even under heavy treatment with inorganic fertilizers, to produce a crop except when stable manure was applied to the young plants. In controlled greenhouse experiments, however, it produced, when treated with from 25 to 50 parts per million of manganese applied as sulfate, vigorous growth and fruiting of tomato plants, while under the same conditions but in the absence of the manganese the plants were greatly retarded in growth, failed to blossom, and developed a strikingly characteristic chlorosis, the unfavorable symptoms disappearing rapidly upon subsequent treatment with the manganese compound. Similar work in the field led to equally marked increases in growth and in the commercial yield of the fruit. The case presented is considered a striking example of the possible deficiencies of modern pure fertilizer compounds when applied to soils lacking in minor, but essential, plant growth constituents.

The effect upon the nitrogen content of the soil of prolonged cultivation without fertilizer [trans. title], J. DUMONT (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1927), No. 13, pp. 605-608).—The condition with respect to nitrogen content in three groups of plats is presented in this report. The first group contained, in 1875, 2.04 gm. of nitrogen per kilogram of soil, which dropped in 1878 to 2.00 gm. in the fertilized and cropped plats and to 1.70 gm. in the unfertilized and cropped plats, while the corresponding figures for later years were in 1881, 2.00 and 1.53; in 1888, 1.85 and 1.49; in 1889, 1.85 and 1.52 (this temporary increase is attributed to the introduction of a leguminous crop); in 1897, 1.86 and 1.48; in 1903, 1.72 and 1.36; and in 1927, 1.78 and 1.19. The second group of plats, somewhat similar figures for which are cited, included cropped and uncropped plats which were without additions of fertilizer from 1892 to 1927, the initial

nitrogen content being 1.71 and the final 1.12 gm. in the soil upon which no crop was grown and 1.32 gm. in the regularly cultivated plat. The third group, without fertilizer since 1902, contained, as an average for the 8 plats, 1.06 gm. of nitrogen at the beginning of the experiment, the 1927 figure being 1.33 gm. The annual loss, 0.0132 gm., is practically identical with that observed in the older plats.

The general conclusion is reached that the periodic use of legumes will reduce nitrogen losses to an insignificant minimum.

The use of fertilizers in the eastern section [of France] [trans. title] (*Off. Région. Agr. Est [France] Bul. 15 (1926), pp. 188*).—This bulletin consists of articles by the directors of agriculture for the respective districts on the local use of fertilizers in 10 districts of eastern France.

The evolution of the fertiliser industry, J. HENDRICK (*Highland and Agr. Soc. Scot. Trans., 5. ser., 39 (1927), pp. 79-96*).—This is a concise and consecutively historical account of the stages of the investigational and industrial development of the manufacture of artificial fertilizers from Lawes' patents to the modern German synthetic concentrates, with some indication of the possible further development both of markets and of the supplies of artificial fertilizer materials. With the exception of a brief passage emphasizing the importance of soil and fertilizer research at the English agricultural experiment stations other than Rothamsted, the point of view taken is a general rather than a strictly national one, and the paper concentrates much information with respect to the world's present fertilizer situation into comparatively few words. In a concluding section the author predicts the concentration as an inevitable result of the enormous cost of equipment in the nitrogen-fixing industries, of the entire fertilizer industry into the control of a few powerful firms or syndicates "heavily capitalized and thoroughly equipped with all modern weapons"; great increase in the production of concentrates; and other consequences of the present trend.

1927 "year book" [of] Commercial Fertilizer (*Atlanta: Walter W. Brown Pub. Co., 1927, pp. 131, figs. 19*).—This is essentially similar to the preceding issue (*E. S. R., 56, p. 423*), containing information with respect to various phases of the fertilizer trade, special articles, and several directories, including lists of the agricultural experiment stations and of the officers in charge of State fertilizer law enforcement.

Commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 146 (1927), pp. 64, figs. 2*).—This circular presents the usual analyses for 1926, information with respect to the State law, and advice with respect to the purchase of fertilizers.

AGRICULTURAL BOTANY .

Plant yield and the intensity of external factors—Mitscherlich's "Wirkungsgesetz," G. E. BRIGGS (*Ann. Bot. [London], 39 (1925), No. 155, pp. 475-502, figs. 2*).—The purpose of this paper is to consider the question of how far the law of Mitscherlich, in its final form (*E. S. R., 49, p. 815*), expresses the relation between the yield and the intensity of the external factors governing growth, and to ascertain the practical use and the physiological significance of that expression. It is stated that for a given intensity of external factor the yield expressed as a fraction of the maximal yield is the same for all plants and conditions. Pot cultures are of no use in forecasting the effect of a supply of manure on field cultures, since the volume of soil and the quantity of each nutrient are unknown. Errors probably arise in the process of eliminating extra plants after germination.

"A consideration of our knowledge as to the development of a plant and as to the effect of variation of nutrient supply at different stages suggests that the agreement of figures, calculated from any simple expression such as that of Mitscherlich with results from pot cultures in which the nutrient changes with time in an unknown fashion, can have little physiological significance."

Metabolic assimilation in higher plants [trans. title], K. MÖRNER (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 1 (1926), No. 4, pp. 472-552, figs. 2).—An account in detail as to work, results, and conclusions is given of this application of quantitative microchemical methods to the investigation of nitrogen metabolism, movement, and storage in leaves and stems of various plants which are named. The seedling stage is excluded. Particular reference is made to amides.

The physiology of organic acids in green plants, I, II [trans. title] (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 1 (1926), No. 4, pp. 558-568).—The two parts of this work, as given in compact detail, are summarized below:

I. *Reciprocal relations in nitrogen and oxygen changes in Begonia semperflorens*, W. Ruhland and K. Wetzl (pp. 558-564).—An outline is given of the formation of ammonia and of oxalic acid, of the influence of nitrogen-containing and nitrogen-free nutrients on oxalic acid content, and of the daily variations in nitrogen and oxygen metabolism.

II. *Daily variations and otherwise conditioned changes in the content of several organic acids in green plants*, H. Ullrich (pp. 565-568).—Details are given of studies with *Anemone nemorosa*, *Rubus idaeus*, *B. semperflorens*, *Lactuca sativa*, and *L. virosa*.

Chemical studies in the physiology of apples, I-IV, (Ann. Bot. [London], 39 (1925), Nos. 153, pp. 77-121, figs. 13; 156, pp. 811-839, figs. 2).—This series includes "a description of some correlated chemical and physiological investigations which are being carried out in connection with researches on cold-storage problems."

I. *Change in the acid content of stored apples and its physiological significance*, D. Haynes (pp. 77-96).—These data have been noted from another source (E. S. R., 55, p. 439).

II. *The nitrogen content of stored apples*, H. K. Archbold (pp. 97-107).—This work, undertaken to determine the possible significance of nitrogen in the metabolism of the apple and in the changes leading to breakdown of the fruit, involved a preliminary survey of nitrogenous substance present in different apple varieties and in the same variety grown in different localities; determination of the sampling error, and its variation during storage; investigation of the nature of the nitrogenous material present; observation of the changes of total nitrogen during storage; and correlation of these data relating to nitrogen with changes in other constituents.

The method is described as giving a nitrogen content in apples varying from 0.02 to 0.08 per cent of the fresh weight. The variations in the nitrogen content of single apples of the same variety may reach 0.55 per cent. The nature and distribution of nitrogenous substances are described. The nitrogen is in the form of protein, only a trace of which can be extracted in a truly soluble form. The determined nitrogen is regarded as a measure of the protoplasm present. By the Kjeldahl method the nitrogen is found to decrease during storage. Since no protein degradation products were found in the juice, a process of protein oxidation is suggested. A correlation is observed between the nitrogen content, acidity, and respiration rate of single apples, a high

nitrogen value being associated usually with low acidity and high respiration rate.

III. *The estimation of dry weight and the amount of cell-wall material in apples*, H. K. Archbold (pp. 109-121).—Methods of determining total dry weight of apples were investigated, and one in which material is heated for 36 hours at 100° C. was adopted. The dry weight obtained by this method is lower than that obtained by calculation from the density of the juice. This difference, which decreases during storage, is attributed to the presence of a volatile higher alcohol, the amount of which lowers with time. Methods of determining the amount of cell-wall material by water extraction and alcohol extraction are described, with discussion. These methods are applied to the determination of the changes in dry weight and cell-wall material during storage.

IV. *Investigations on the pectic constituents of apples*, M. H. Carré (pp. 811-839).—These data have been noted from another source (E. S. R., 55, p. 646).

The regional and seasonal distribution of potassium in plant tissues, E. S. DOWDING (*Ann. Bot. [London]*, 39 (1925), No. 154, pp. 459-474, pl. 1, figs. 6).—In this account of an attempt to apply microchemical methods of investigation to the presence of potassium in plants, it was found that potassium is absent from the wood of the mature root of spruce during the winter. Increase of potassium in the vascular system occurred throughout all organs of the spruce in the spring and in winter when grown in greenhouse temperature. All meristematic cells are particularly rich in potassium. During spruce bud elongation there occurs a translocation of the potassium within the embryonic zone into the next year's meristem and to the embryonic leaves. In the mesophyll of the mature spruce leaf an increase occurs in potassium content during early winter and a decrease during early spring. In summer the potassium in the mesophyll occurs as a network of granules between the chloroplasts. In winter localizations appear in the proximity of the laked chloroplasts.

The distribution of potassium and of sodium in plants [trans. title], G. ANDRÉ and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 184 (1927), No. 25, pp. 1501-1503).—The percentages of sodium and of potassium and the potassium-sodium ratio are indicated for different plants as found during 1926 and 1927.

Effect of hydrogen-ion concentration on the absorption of phosphorus and potassium by wheat seedlings, J. DAVIDSON (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 4, pp. 335-346).—Laboratory experiments are reported in which water cultures of wheat seedlings were grown in potassium phosphate solutions of different initial H-ion concentrations.

Relatively more potassium than phosphorus was absorbed by the seedlings, irrespective of the initial H-ion concentration of the solution. In the solutions with initial H-ion concentrations of 5.0 and lower the preferential absorption of potassium resulted in increased acidity, while in solutions of H-ion concentrations of 6.0 and 7.0 the increase in acidity was slight. More phosphorus was absorbed by the seedlings from the solutions with initial pH values of 5.0 and lower than from those with pH values of 6.0 and 7.0. As all potassium salts of phosphoric acid are soluble, it is claimed that this shows that the physiological availability of phosphorus depends upon the H-ion concentration of the medium.

The general character of the results was not affected by the duration of the experiments, by the age of the seedlings, or by the concentration of the solution, provided the differences in initial reactions in the solutions of the lower concentrations were maintained by daily renewal. The excess of phosphorus

absorbed from the acid solutions was found in the tops of the seedlings, and they also had a higher potassium content than those from the neutral solutions. The roots from the neutral solutions contained more phosphorus and almost twice as much potassium as those from the corresponding acid solutions. The power of the seedlings to absorb phosphorus and potassium was found to decrease as they advanced in age.

The absorption phenomena reported by the author from his experiments, as well as the absorption of cations and anions by living cells in general, are said to be explained by the assumption that there is a relatively wide range in the isoelectric points of individual protoplasmic ampholytes.

Influence of the concentration of H ions in water of imbibition on the germinative energy of cereal seeds treated by the Jensen (hot water) method [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg.* [Rome], n. ser., 6 (1926), No. 2, pp. 161-171, fig. 1).—The data are tabulated, with discussion.

Catalase in relation to growth and to other changes in plant tissue, J. E. KNOTT (*New York Cornell Sta. Mem.* 106 (1927), pp. 63, figs. 11).—After describing the methods adopted for determining the relative catalase activity of plant tissues, the results are given of experiments on the activity of catalase in different portions of celery and spinach plants as affected by position, age, temperature, and other factors.

It was found that the younger and the older leaves of spinach and celery are usually low in catalase activity, while those intermediate in age have a higher and approximately equal activity. An increase of 10° F. increased the catalase activity of celery plants within 24 hours, and when removed to a temperature lower by 10° they maintained their higher catalase content for several days. No relation was found between the pH of the juice of the plant as a whole, or of the apical 2 in. of the seed stalk, and the catalase activity of the intermediate leaves. No significant difference in catalase in the leaves of plants could be observed in respect to a vegetative or a reproductive type of growth. The catalase activity of the apical 60 mg. from which all but the smallest leaves had been removed was found to decrease as the spinach plant changed from a vegetative to a reproductive type of growth, suggesting a localized response to the longer daylight period. The amount of the decrease was found to be closely correlated with the increase in height of seed stalk. If elongation ceased and vegetative growth was resumed, the high catalase activity returned.

Respiration as measured by carbon dioxide evolution seemed to be higher in the apical tissues from vegetative plants. Phosphorus and nitrogen, when supplied to the plant through the roots, resulted in increased catalase activity. Calcium nitrate, when added to catalase in bottles, decreased, while asparagine, sucrose, and soluble starch increased the activity after 24 hours when they were added in amounts which increased by 50 or 100 per cent the nitrogen, amino acid, sugar, and starch content of the tissue. Since the effect of these substances in bottles was practically opposite to that in living plants, it is considered possible that when reacting within the plant cell the peroxide or other substance may not decompose the catalase.

Studies on the tissues concerned in the transfer of solutes in plants: The effect on the upward transfer of solutes of cutting the xylem as compared with that of cutting the phloem, O. F. CURTIS (*Ann. Bot.* [London], 39 (1925), No. 155, pp. 573-585).—It is claimed that though many types of ringing experiments previously reported (*E. S. R.*, 52, p. 125) had uniformly shown that ringing interferes with the upward transfer of solutes, it had not been definitely determined that this hindrance may not have been due to plugging

or other alteration of the xylem resulting from the ringing. Evidence is presented, with discussion, which indicates that plugging could have been but partial at most, and that partial plugging could not fully account for the hindrance in solute movement.

Experiments in which the effects on solute transfer of cutting the xylem, as compared with those of cutting the phloem, are described. By the use of divided stems, water being supplied to the tops by one set of roots and nitrogen by the other, incomplete data were obtained indicating that if the roots supplied with nitrogen are connected with the top by the xylem only there was little transfer of the nitrogen to the tops, while if they were connected by a strip of phloem only considerable transfer occurred. Experiments using defoliated growing shoots showed that when the shoots were attached to the parent plant by the xylem only they failed to grow, evidently because some material necessary for growth could not move through the xylem, while those connected by a strip of phloem made a growth nearly as good as did the stems having both xylem and phloem, indicating that the phloem could carry these materials. The water content of the ringed shoots exceeded that of the controls and those with the xylem cut, indicating that lack of water was not causal in growth failure.

In one series the ringed shoots showed an excessively low sugar content as compared with the controls and the stems having cut xylem. In another series the ringed shoots, though they had less total sugar, had, on the percentage basis, a sugar content considerably in excess of those of the other treatments, indicating that some other factor was limiting in this series.

It is thought that solute movement, both upward and downward, occurs chiefly through the phloem tissues, and that this is hastened by streaming movements within the living cells.

Mercurialis.—III, A consideration of the physiological significance of the chromogen, P. HAAS and T. G. HILL (*Ann. Bot. [London]*, 39 (1925), No. 156, pp. 861–865).—From *Mercurialis* may be extracted a colorless chromogen, hermidin, which shows a marked avidity for gaseous oxygen. Hermidin undergoes oxidation in two stages, yielding a blue compound, cyanohermidin, and a yellow compound, chrysohermidin, the volumes of oxygen fixed during these two stages being equal. Each of these two compounds is capable of being reduced to the other, and *Mercurialis* possesses a mechanism capable of reducing cyanohermidin to hermidin. It is suggested that hermidin plays a part in the respiratory mechanism of the plant, especially in the absorption and transfer of oxygen.

On the development of buds upon roots and leaves, T. HOLM (*Ann. Bot. [London]*, 39 (1925), No. 156, pp. 867–881).—Many trees and shrubs of widely different families develop root shoots, but only about 180 species of herbs possess that power. The root shoots have been classified as reparative, additional, and necessary, the additional occurring most frequently. The occurrences, correlations, and importance of root shoots on various plants are discussed.

Heat resistance in functioning guard cells [trans. title], F. WEBER (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot.*, 1 (1926), No. 4, pp. 553–557).—A short account is given of studies on heat resistance in leaf stomatal guard cells of *Zebrina pendula*, *Rumex* sp. (*R. patientia* or *R. crispus*), *R. acetosa*, *Dahlia variabilis*, and *Bellis perennis*.

The growth of the cotton plant in India.—I, The relative growth-rates during successive periods of growth and the relation between growth-rate and respiratory index throughout the life-cycle, R. S. INAMDAR, S. B. SINGH, and T. D. PANDE (*Ann. Bot. [London]*, 39 (1925), No. 154, pp. 281–311, figs. 8).—

In a study of cotton plant growth in India, as measured by the dry-weight method, the growth per week being calculated on an experimental basis, the relative growth-rate curves of plants grown in different periods of the year are compared. The growth-rate curves are also compared with variations in the leaf-weight ratio and the leaf-area ratio. The growth-rate curve is divided into three phases, which are indicated. A general discussion of the internal and external factors concerned in the dry-weight production by the plant is included. The growth-rate curve is compared with the course of the respiratory index in the plant and its parts throughout the entire growth period.

The effect of length of day upon the growth and reproduction of some economic plants, M. A. H. TINCKER (*Ann. Bot. [London]*, 39 (1925), No. 156, pp. 721-754, pls. 3).—In studies giving particular attention to herbage plants, it was found that in case of soy beans (three varieties), chrysanthemums, and runner beans shortening the periods of natural illumination hastened blooming and modified and controlled growth, and that under like conditions red clover (three varieties), cereals (several species, about 20 types), and radishes showed retardation. Under shorter days the seasonal habit change did not occur. Foxglove gave an intermediate type of results. In general, these studies gave results agreeing closely with those of Garner and Allard (*E. S. R.*, 45, p. 730). The complex day-length factor is discussed. Apparently this factor consists of a number of significant units.

The results emphasize the plasticity of the plant, and the evidence shows the controlling influence of environment on internal chemical composition, plant form, behavior, and periodicity.

The development and distribution of chlorophyll in roots of flowering plants grown in the light, D. POWELL (*Ann. Bot. [London]*, 39 (1925), No. 155, pp. 503-513, figs. 9).—It is claimed that chlorophyll developed in the roots of 13 out of 16 species grown with their roots exposed to the light of a 200-candle-power electric lamp. It was found that the distribution of chlorophyll in the roots was constant for any given species but varied from species to species. In some cases the green zone was sharply delimited, forming a very striking feature in transverse sections. Apparently chlorophyll formation in the roots is favored by conditions advantageous to assimilation in the shoot. The effect of culture solutions is similar to that of tap water and the same is true as regards seedlings grown in damp air, so that poor aeration of roots growing in solution does not appear to be a relevant factor in the distribution of chlorophyll. Well-developed plastids were found in all cells of the cortex, as well as in the green zone. Chondriosomes were apparently present together with the plastids in all the cells of roots grown in light or in darkness.

Plant electricity.—I, Photo-electric currents associated with the activity of chlorophyll in plants, J. C. WALLER (*Ann. Bot. [London]*, 39 (1925), No. 155, pp. 515-538, figs. 6).—The author, reviewing previous studies by others, describing in detail the apparatus and method, and giving results of his own work, states that the petals of hydrangea during development undergo parallel changes in coloration and in photo-electric response. The power of electrical response to light by various plants is in general confined to those organs which show a green coloring. Various changes and relations are detailed.

Behavior of fungus mycelium in nutritive media under electrical charges [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 152-159, figs. 2).—Tabular showing is made of the developmental behavior of fungi (*Blepharospora cambivora* and *Penicillium glaucum*) under varied experimental conditions when subjected to electrical charges differing as to sign and potential.

Polarity phenomena in seakale roots, W. N. JONES (*Ann. Bot. [London]*, 39 (1925), No. 154, pp. 359-372, figs. 9).—Attention is drawn to different ways in which polarity in plants can express itself, and observations concerning regeneration in root cuttings of sea kale are described and summarized.

Some observations on the action of radium on certain plant cells, M. WILLIAMS (*Ann. Bot. [London]*, 39 (1925), No. 155, pp. 547-562, figs. 3).—A résumé of studies by earlier workers on animal and plant cells and of their results, with an account of the methods employed in the present work, is followed by a description of changes seen in *Saxifraga umbrosa* and *Elodea* sp. under various exposures combining the influences of the β -rays and of γ -rays from radium as regards the general course of the changes, circulatory rate, stomatal aperture, plasmolysis, and after effects. Any change that becomes visible is irreversible.

Action of X-rays on normal meristems of *Ricinus communis* [trans. title], V. RIVERA (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 144-152, figs. 3).—Studies extending those previously noted (*E. S. R.*, 56, p. 629) were made on the development during spring and summer of *R. communis*, and it was found that the stunting and deforming effects of the X-rays upon the shoot-tip meristems were positive and clear. It appears that the young normal and the pathological meristems are influenced in like ways by the X-rays.

The carbon nutrition of *Penicillium glaucum* [trans. title], H. COUPIN (*Compt. Rend. Acad. Sci. [Paris]*, 184 (1927), No. 25, pp. 1575-1577).—The carbon nutrition of *P. glaucum* is assured by the use of any one of 22 out of 47 fatty compounds tried.

Studies of the genus *Fusarium*, I, II (*Ann. Bot. [London]*, 38 (1924), No. 150, pp. 379-383; 39 (1925), No. 154, pp. 373-408, figs. 8).—A detailed investigation was planned of 6 forms of *Fusarium*, 3 of these showing differences of specific rank and 3 classed as varieties of 1 of 3 species, and study was started on 1 of these forms as to growth, staling reaction, and influence of media. The continuance and modification of this study are indicated in the second section, which appears below.

I. General account, W. Brown and A. S. Horne.—It was found that the most important growth-medium factor was the carbon:nitrogen ratio, the effects of which are detailed. Temperature was an important factor, and a rise increased staling and lowered spore septation. In single-spore cultures, the sectorial effect indicated occasionally the development of new strains. Such saltations have increased the number of forms from 6 to nearly 40. Four types are described, some showing differences thought to be entitled to specific ranking. In view of the known genetic relationship between these forms, they are grouped together under 1 specific name, *F. blackmani*. Further work was projected.

II. An analysis of factors which determine the growth-forms of certain strains, W. Brown.—Continuation of the examinations above indicated, with particular attention to the nutrient-medium factors, composition, and concentration and with less emphasis on light and temperature, has shown that all the strains have about the same intrinsic growth rates, that they differ as regards the degree of staling, and that any strain may be made to grow in the staling or nonstaling form by sufficiently concentrating or diluting the nutrient medium. The effect of concentration is described for several type strains. A study of the dependence of growth form is indicated, with results, and observations are recorded on the phenomena of zonation and sclerotium formation.

Nuclear phenomena associated with heterothallism and homothallism in the ascomycete *Neurospora*, B. O. DODGE (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 4, pp. 289-305, pls. 3, figs. 5).—A discussion is given of the nuclear

behavior of *N. sitophila* and *N. tetrasperma*, which is said to account for the fact that heterothallic strains may segregate out of a species which is commonly homothallic (E. S. R., 57, p. 620).

Life-history and cytology of *Rhytisma acerinum* (Pers.) Fries, S. G. JONES (*Ann. Bot. [London]*, 39 (1925), No. 153, pp. 41-75, pl. 1, figs. 23).—An account is given of *R. acerinum* as a parasite forming stromata on the leaves of the sycamore maple and after leaf fall living probably on the food stored chiefly by the mycelium filling up the host cells which are permanently attached to the stroma.

GENETICS

Genetics [trans. title] (*Ann. Sci. Agron. Franç. et Étrang.*, 44 (1927), No. 2-3, pp. 219-239).—Continued breeding work (E. S. R., 56, p. 630) and genetic studies with wheat, oats, rye, barley, corn, and potatoes are reported on.

A working hypothesis for segmental interchange between homologous chromosomes, J. BELLING (*Natl. Acad. Sci. Proc.*, 13 (1927), No. 10, pp. 717, 718).—A contribution from the Carnegie Institution.

The chromosomes of *Ranunculus acris*, H. SOROKIN (*Amer. Nat.*, 61 (1927), No. 677, pp. 571-574, figs. 8).—Further information (E. S. R., 57, p. 122) is presented on the cytology of *R. acris*.

Studies on the sauropsid chromosomes.—I, The sexual difference of chromosomes in the pigeon, K. OGUMA (*Jour. Col. Agr., Hokkaido Imp. Univ.*, 16 (1927), No. 4, pp. 203-227, pls. 2).—The results of chromosome counts from germinal and somatic tissue of male and embryo pigeons showed that the diploid number was in males 61 and in females 62, confirming the heterozygous composition of females as regards sex and the homozygous condition of males as regards the sex chromosomes.

The sugary gene in maize as a modifier of the waxy ratio, R. A. BRINK (*Genetics*, 12 (1927), No. 6, pp. 461-491, figs. 6).—The results of further experiments (E. S. R., 57, p. 721) at the Wisconsin Experiment Station relating to the anomalous action of the sugary gene in corn on the waxy ratio are discussed.

The marked deficiency of waxy seeds, as compared with Mendelian proportions, resulting when pollen from *su su Wx wx* plants is used could not be accounted for on the basis of irregularities at the reduction divisions. A study of the distribution of waxy and nonwaxy seeds on a series of ears resulting from crosses of the type *su su wx wx* × *su su Wx wx* revealed no significant difference between the upper and lower halves, indicating that the deficiency of waxy seeds in such cases is not due to a constantly different rate of growth of *su Wx* and *su wx* pollen tubes.

Proximate chemical analyses of pollen from *Su Su Wx Wx*, *Su Su wx wx*, *su su Wx Wx*, and *su su wx wx* plants did not show differences evidently related to the developmental capacities of the male gametophytes arising from these individuals. Investigation on the relative weights of the four classes of seed on ears segregating for sugary and waxy demonstrated that the double recessive combination, **sugary waxy**, does not have a disproportionate effect on the amount of reserves synthesized. During the development of the seedling the endosperm reserves in the sugary waxy seeds were as readily utilized and the sprouts grew as rapidly as those of the other three types, *Su Wx*, *Su wx*, and *su Wx*. Both *su Wx* and *su wx* pollen tubes were handicapped in development as compared with the corresponding nonsugary classes. The waxy type pollen was affected in a significantly greater degree.

"In the light of the present evidence it appears probable that the deficiency of waxy seeds usually observed in nonsugary stocks is also due to differential development during the initial stages of pollen tube growth."

A lethal mutation in maize affecting the seed, R. A. BRINK (*Amer. Nat.*, 61 (1927), No. 677, pp. 520-530, fig. 1).—A lethal mutation, *de_u*, affecting seed development in corn appeared in the progeny of a cross between an inbred strain of Burr White dent and a homozygous waxy stock in studies at the Wisconsin Experiment Station. The gene seemed to occupy a locus in chromosome I and showed 19.4 per cent of crossing over with *wx* and 16.5 per cent with *sh*. It was provisionally concluded that the order of the factors is *sh-de_u-wx*.

Inheritance studies in soybeans.—II, Glabrousness, color of pubescence, time of maturity, and linkage relations, F. V. OWEN (*Genetics*, 12 (1927), No. 6, pp. 519-529).—The second of this series (E. S. R., 57, p. 822), a contribution from the Wisconsin Experiment Station, describes a dominant factor *P₁* for glabrousness in the soy bean which is linked with *R₁*, the factor for black seed coat color. The limited data did not permit an accurate estimate of the amount of crossing over. The factor *p₂*, observed by Stewart and Wentz (E. S. R., 56, p. 632), seems to produce the same effect as *P₁* but is inherited as a recessive rather than as a dominant factor. A factor *E* has been assumed responsible for early maturity in the Black Eyebrow variety of soy bean because of the peculiar correlation with *T*, the factor for tawny pubescence. Both *E* and *T* are inherited independently of *P₁*.

Cytoplasmic inheritance in flax, R. J. CHITTENDEN (*Jour. Heredity*, 18 (1927), No. 8, pp. 336-343, figs. 4).—Further consideration is given the flax hybrids noted earlier (E. S. R., 57, p. 124).

Examples of cytoplasmic inheritance in plants provided by instances of anisogony, e. g., flax, seem of especial interest as they suffer from few of the disadvantages such as complications introduced by the presence of a Y chromosome or the possible alternative explanations which can not be excluded by experiment. The facts suggested that the cytoplasm or some cytoplasmic constituent other than the plastids has individuality and is inherited for an indefinite number of generations so far as is at present known only in the female line, i. e., a third mechanism of inheritance exists, the cytoplasmic as opposed to that of the plastids and nucleus. Species and even races may differ in cytoplasmic as well as in nuclear constituents. Like the chromosomes, the cytoplasm appears capable of variation and may have a definite effect on the ultimate result of the reaction of nucleus and cytoplasm.

Indications of the transmission of an acquired character in flax, H. L. BOLLEY (*Science*, 66 (1927), No. 1709, pp. 301, 302).—The development of strains or varieties of wilt-resistant flax at the North Dakota Agricultural College which can transmit a certain degree of immunity to progeny resulting from hybrids with nonresistant strains is commented on.

"Our results indicate no other conclusion than that wilt resistance may be accumulated rather rapidly by a nonresistant strain or variety and that, when it is thus accumulated, it is transmitted from generation to generation through seed; and, further, that when once obtained to a certain degree, it can be fixed through artificial crossing."

A second case of maternal inheritance of chlorophyll in maize, M. DEMEREC (*Bot. Gaz.*, 84 (1927), No. 2, pp. 139-155, fig. 1).—A chlorophyll variegation in corn, inherited through the female parent only, gave pale green, variegated, and green progeny, irrespective of the kind of pollen used in fertilization, in studies at Cornell University. Although it is said to duplicate in all

respects the inheritance of the character described by Anderson (E. S. R., 53, p. 229), it differs therefrom by having an independent origin and a dissimilar phenotype. Attempts to transmit the character asexually by inoculation were unsuccessful.

A factor for yellow-green chlorophyll color in maize and its linkage relations, M. T. JENKINS (*Genetics*, 12 (1927), No. 6, pp. 492-518).—A chlorophyll variation of corn designated yellow-green, *yg*, isolated at the Iowa Experiment Station in cooperative studies with the U. S. Department of Agriculture, was found to behave as a simple Mendelian recessive to the normal. The factor pair, *Yg yg*, was located on chromosome I, a distance of 20.5 units to the left of *O c*.

Correlation between milk-yield and butter-fat-percentage in Ayrshire cattle.—I, Individual correlation, G. BONNIER (*Hereditas*, 10 (1927), No. 1-2, pp. 230-236).—The author has calculated the correlation coefficients between the butterfat percentage and the milk yields in individual tests for each of 79 Swedish-Ayrshire cows. The correlation coefficients varied from +0.0169 to -0.8337. The correlation between the correlation coefficients thus calculated and the mean fat percentage was +0.4688 and the mean milk yield -0.0611.

Fisher's *z* values ($\frac{1}{2} [\log_{\frac{1}{2}}(1+r) - \log(1-r)]$) were calculated for the correlations between fat percentage and milk yield for the individual cows and for the two above-noted correlation coefficients. It is concluded, on the assumption that fat percentage is hereditary, that the relation of fat percentage to milk yield is likewise hereditary, but no similar relation existed between milk yield and the correlation between fat percentage and yield.

The albino factor in the Samojede dog, K. TJEBBES and C. WRIEDT (*Hereditas*, 10 (1927), No. 1-2, pp. 165-168).—Preliminary experiments have indicated that the factor responsible for the coat color of Samojede dogs belongs to the albino series, reducing in heterozygotes the red pigment but not the black. Samojede dogs have white, silk hair except on the extremities, with a relatively small number of brown pigmented hairs interspersed between the white hairs.

Sex and sex-determination in the light of observations and experiments on diecious plants, J. H. SCHAFFNER (*Amer. Nat.*, 61 (1927), No. 675, pp. 319-332, fig. 1).—This contribution from the Ohio State University lists 26 papers by the author dealing with the problem of sexuality.

"Thus the three lines of evidence, the noncorrespondence of chromosome aggregations and segregations with the time of sex determination in the great majority of plant and animal types; the taxonomic relation of the unisexual and monosporangiate species to the hermaphroditic and bisporangiate species; and the experimental work on the diecious species themselves—all confirm the statement, which is after all more a statement of fact than theory, that sexuality is physiological and that specific sexuality as maleness and femaleness is not a matter of Mendelian heredity, but is conditioned on functional states."

Temperature and time of development of the two sexes in *Drosophila*, G. BONNIER (*Brit. Jour. Expt. Biol.*, 4 (1926), No. 2, pp. 186-195, figs. 4).—By making transfers at 2-hour intervals of the eggs and pupae of *Drosophila*, the author found that the time required for males to develop at 25° C. (77° F.) to the pupal stage was 116.78 ± 0.20 hours, while females required 116.62 ± 0.19 hours for similar development. Thus there was no significant difference in the time required for the two sexes. However, the duration of the pupal stage for males was 115.46 ± 0.13 hours and for females 111.36 ± 0.15 hours, making a difference of 4.10 ± 0.20 hours in the duration of the pupal stage for the two sexes. At 30° the time of development up to the pupal stage was 103.37 ± 0.43 hours for males and 99.95 ± 0.49 hours for females. The respective

sexes were 84.26 ± 0.34 and 78.15 ± 0.50 hours in the pupal stage at this temperature.

Further study of the data for the 25° temperature showed that there was a correlation of -0.256 ± 0.40 between the time required for development up to pupation and the duration of the pupal stage. In males the correlation was -0.007 ± 0.027 , thus indicating that as the period prior to pupation was lengthened the pupal stage was shortened and vice versa. A comparison of the development at the two temperatures showed that the shortening of the period required was much more pronounced for the pupal than for the pre-pupal stages at the higher temperature.

Sex-intergrades in foetal pigs. W. HUGHES (*Biol. Bul. Mar. Biol. Lab., Woods Hole*, 52 (1927), No. 2, pp. 121-136, pls. 4).—The author describes from among 17 cases of twins, observed in the examination of 400 uteri, 4 cases in which fusion of the fetal membranes and vascular intercommunications were followed by abnormalities of the sex equipment of one or the other component twin. Three of the cases were heterosexual, while the twins in the fourth case were both males.

There appears to be no doubt but that the females of the heterosexual pairs would have developed into typical sterile freemartins, such as occur in cattle. In the fourth case, in which both twins were males, after differentiation of the external genitalia, an insufficiency of the blood supply and a hypothetical deficiency in the hormone for the quantitative sex-differentiating stimulus affected the differentiation of the genital ducts, degeneration of the mesonephron and growth and descent of the testes, making their growth irregular and uncontrolled.

Studies on the sex-ratio and related phenomena.—IX, Observations on fertility and sex-ratio in mice, 1922-5, A. S. PARKES (*Brit. Jour. Expt. Biol.*, 4 (1926), No. 1, pp. 93-104, fig. 1).—In continuing this series (E. S. R., 56, p. 71), the annual variations in the sex ratios of 2,903 mice born in 458 litters during the four years from November, 1921, to October, 1925, did not show any significant differences. The average size of litter and percentage of males were then tabulated according to months and combined by three-month periods. For such periods the average size of litter and percentage of males were, respectively, October-December 6.46 and 55.9, January-March 6.14 and 51.9, April-June 5.82 and 48.2, and July-September 6.35 and 52.2. The January-March and July-September sex ratios were practically the same as the average for the entire period, i. e., 51.7 ± 0.77 per cent. There was no significant variation in the sex ratios in the different litter sizes among themselves or as compared with the average. The author believes that the results point toward a greater prenatal mortality of males.

The testis and thyroid in a hen-feathered silver-grey Dorking cock. G. BUCHANAN (*Brit. Jour. Expt. Biol.*, 4 (1926), No. 1, pp. 73-80, pls. 2).—Examination of the endocrine glands of a hen-feathered silver-gray Dorking cock at the University of Melbourne showed that the testes and thyroids were abnormal, the former containing large masses of luteal cells, encapsulated fibrosed masses, abnormal spermatogenesis, and nonfunctioning tubules, while in the thyroids myxoedematous and cystic conditions were observed. Studies of the testicles and thyroids of two Sebright bantams and six normal brown bantams were made for comparison. From the evidence it was suggested that the thyroids influence plumage characteristics in conjunction with the gonads, but the action is antagonistic.

A suggested hypothesis is set up giving the values of +3 to normal testicles, +6 to normal ovaries, -5 to normal thyroids, and -2 to degenerated thyroids,

If the algebraic sum is +1 or over, the plumage is of the female type, but if -2 or less, it is of the male type.

The vitality of the spermatozoa in the male and female reproductive tracts, J. HAMMOND and S. A. ASDELL (*Brit. Jour. Expt. Biol.*, 4 (1926), No. 2, pp. 155-185, figs. 2).—In testing the duration of the vitality of spermatozoa in the male reproductive tract of rabbits, the middle part of the epididymis between the upper and lower poles was ligated in two places and cut between the ligatures. Such males were mated with normal females at intervals up to 120 days, and litters were produced up to 40 days after the operation, although such fertilization was accomplished only by mating 3.5 hours before ovulation, which was brought about by a preceding mating with a sterile buck. Such fertilization could have resulted only from the spermatozoa stored in the tail of the epididymis. Normal fertility was maintained up to about the twentieth day after the operation.

Examination of a drop of fluid collected from the lower end of the vulva after mating and of the fluids of the lower epididymis when such bucks were killed showed that the sterility which began to appear 20 days after the operation was not due to a lack of sperms, as in every case spermatozoa were found up to 60 days and in one case they were motile at this time. The litters produced were smaller, however, as the time after the operation increased. An increased percentage of females was observed in litters sired more than 20 days after the operation, but as there were only 12 such litters the differences are not considered as significant.

Several methods were attempted for testing the duration of the vitality of sperms within the female tract. Mating females near the end of the pseudo-pregnant period and inducing ovulation at a later date by a mating with another buck and identifying the paternity of the offspring by color characteristics was not as satisfactory for a determination of definite limitations on the vitality of the sperm as artificial insemination followed by mating with a sterile buck to induce ovulation, which has been quite definitely fixed in the rabbit at 10 hours after copulation.

Of the 22 does that were mated with vasectomized bucks from 2 hours before insemination to 8 hours after, 91 per cent produced litters, but the fertility began to decrease for females mated more than 8 hours after insemination down to a point where only 12.9 per cent of the females produced young which were mated 20 hours after insemination. No litters were produced when the interval was longer. The size of the litters also decreased as the percentage of females producing litters decreased, thus the maximum duration of vitality of spermatozoa in the female tract was 30 hours. By comparing the number of fetuses with the number of corpora lutea in the ovaries it was found that the small-sized litters were due to a lack of fertilization of large proportions of the ova shed.

In discussing the differences in the duration of vitality of spermatozoa in the male and female tracts, there are suggested as possible causes for such the difference of 3° F. between the scrotal and abdominal temperatures and the presence of leucocytes in the female tract which have been observed to cause agglutination of the spermatozoa about them. The practical importance of determining the time of ovulation in domestic animals, especially where artificial insemination is practiced, is pointed out.

FIELD CROPS

The influence of crop plants on those which follow, III, B. L. HARTWELL, J. B. SMITH, and S. C. DAMON (*Rhode Island Sta. Bul.* 210 (1927), pp. 23).—The third contribution of this series (*E. S. R.*, 41, p. 135) contains field results,

dealing with liberal fertilization and low acidity, as to miscellaneous crops in 1918 and 1919, followed by mangels in 1920, and also of the miscellaneous crops in 1921 and 1922 followed by carrots in 1923 in a continuing experiment and field observations on the general subject made on other plats. The results of cultures in pot experiments with various amounts of lime, phosphorus, and nitrogen to determine the influence of these applications on the effects of preceding crops are also included.

Indications were that the ability of the following crops to obtain their nitrogen needs decreased in the order—onions, rye, redtop, mangels, and buckwheat.

Aluminum, phosphorus, nitrogen, and the reaction of the ash of the miscellaneous crops of 1924 were determined. It was observed that the crops having the most alkaline ash, i. e., mangels, cabbages, rutabagas, and buckwheat, were the ones which had exerted an outstanding deleterious effect on onions grown in 1910, when the soil was very acid, low in phosphorus, and contained much active alumina. The removal of such crops increased soil acidity and aluminum activity.

Increase in the application of nitrogen was usually accompanied by greater alkalinity of the ash, but increased phosphorus markedly decreased the ash alkalinity. The amount of toxic alumina and its antitoxin, phosphoric acid, removed by the crops was no more than secondary to ash alkalinity in influence.

In recent years liberal applications of lime and phosphorus had overcome the acid soil conditions to such an extent that the outstanding influence of miscellaneous crops on those which followed was not observed. There was some evidence that crops for which slightly acid and neutral soils were unsuited were benefited by being preceded by an alkaline crop.

Residual effects of different irrigation treatments on the crops grown the succeeding year, D. W. ROBERTSON and A. KEZER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 10, pp. 923-943, figs. 2).—The effects of different irrigation treatments applied to wheat (E. S. R., 57, p. 132) on succeeding wheat crops were studied at the Colorado Experiment Station.

Irrigation late in the growing season, i. e., at heading, blossoming, or filling, influenced the following crop more than where water was applied at germination or tillering or where the plats received a distributed irrigation. When the crops of the 2 years were combined the plats receiving a distributed irrigation gave the highest yield of grain and straw. Plats irrigated at heading gave the highest yield of the plats receiving a single irrigation of 6 in. Determinations at the end of the first season showed that more moisture was left in the first 5 ft. of soil when the plats were irrigated at filling, and that the quantity decreased with earlier application. Rainfall during the crop year affected the yield but not the ranking of the different treatments. The succeeding crop grown on the plats irrigated at filling gave the highest yield, whether the rainfall was 5.64 or 23.26 in.

Water requirements of crops, E. S. HOPKINS (*Canada Expt. Farms, Div. Field Husb. Rpt.* 1926, pp. 34-37, fig. 1).—The averages of from 3 to 5 years' results at Swift Current, Saskatchewan, where the mean annual rainfall for the growing season, April to July, inclusive, is 8 in., showed the following number of pounds of water to be used to produce 1 lb. of dry matter: Wheat on fallow 489 lbs. for the whole plant and 1,275 lbs. for the grain; wheat after wheat 764, 2,082; wheat after corn 628, 1,587; wheat after sunflowers 825, 2,562; oats following wheat 619, 2,057; and fall rye on fallow 852, 1,005 lbs. Corn after wheat required 442 lbs. of water for 1 lb. of dry matter in the whole plant, sunflowers after wheat 658, brome grass after wheat 1,024, and sweet clover after wheat 1,113 lbs.

Cultural experiments, E. S. HOPKINS (*Canada Expt. Farms, Div. Field Husb. Rpt. 1926, pp. 14-16, fig. 1*).—Shallow (4-in.) plowing gave as large yields of corn and oats as deep (7-in.) plowing, both on heavy clay soil and on light, sandy loam at Ottawa. On sandy loam soil plowing with wide (16-in.) furrows gave as large yields of corn and oats as were obtained with plowing with narrow (8-in.) furrows. On heavy clay soil, however, there seemed to be a slight advantage in favor of narrow furrows. On clay soil it appeared very desirable to fall plow the land for corn, while this was not so important on sandy loam soil, although fall plowing gave slightly higher yields than spring plowing. Cultivating or disking an alfalfa sod did not increase the hay yield, nor did surface cultivation have much influence on the eradication of couch grass. Cutting alfalfa in one-tenth bloom gave more hay than cutting in the late bud or full bloom stages. Spring plowing was not satisfactory for oats, and ribbing heavy clay was without benefit.

[**The Woburn field experiments, 1925 and 1926**], J. A. VOELCKER (*Rothamsted Expt. Sta., Harpenden, Rpt. 1925-1926, pp. 95-115*).—The yields of the forty-ninth and fiftieth seasons of continuous wheat and barley receiving different fertilizer treatments are recorded and discussed as heretofore (*E. S. R.*, 54, p. 433), together with the results of rotations and green manuring tests, liming trials, inoculation studies with alfalfa, fertilizer trials on grassland, and comparisons of potassium salts on mangels and potatoes. The bolting of mangels and sugar beets has been noted earlier (*E. S. R.*, 57, p. 230).

Range grasses of California, A. W. SAMPSON and A. CHASE (*California Sta. Bul. 430 (1927), pp. 94, figs. 115*).—The more important grasses of the State are described and illustrated, with determinative keys and comments on their distribution, forage value, and adaptation to grazing. The essentials of range management are indicated.

Varieties of barley for Illinois, G. H. DUNGAN, R. W. STARK, and W. L. BURLISON (*Illinois Sta. Bul. 297 (1927), pp. 41-52, fig. 1*).—Oderbrucker, Wisconsin Pedigree, Silver King, and Black Barbless barleys have given the highest yields of the varieties tested on both the DeKalb and station fields. A mixed crop of barley and oats produced more grain per acre than oats grown alone, but the yield was not significantly greater than barley alone. Spring emmer produced less than either barley or oats.

Barley (*Rothamsted Expt. Sta., Harpenden, Rpt. 1925-1926, pp. 20-22, 148, 149*).—Extensive cooperative experiments (*E. S. R.*, 57, p. 328) under the research scheme of the Institute of Brewing indicated that soil and season are the main factors determining yield and quality in barley. Conditions increasing the quantity per acre of nonnitrogenous material in the grain without correspondingly increasing the nitrogen appear also to favor malting quality.

Ammonium sulfate in small quantities (1 cwt. per acre) increased the number of tillers and the number bearing grain. It also increased the grain yield by about 5 bu. per acre in each of the years (1922-1926), the effect being but little influenced by season. It slightly raised the nitrogen content of the grain, but not enough to affect the buyer's valuation. Larger quantities of nitrogenous fertilizers may raise the nitrogen percentage in the grain so much as to be perceptible to the buyer, with consequent fall in valuation. Superphosphate also increased the number of tillers, but at most centers it generally had little effect on yield and no apparent effect on quality or on nitrogen content of the grain. On loams in the eastern counties, however, it increased the yield and decreased the nitrogen percentage. Potassium sulfate caused little or no yield increase, slightly lowered the nitrogen content of the grain, and did not affect the weight per 1,000 kernels or the valuation. Ammonium

chloride appeared to increase the number of kernels per plant by increasing the number per spike rather than the number of spikes. Its action seemed to be to move the material more completely from the rest of the plant to the seed, since it produced no increase in total plant growth per acre. It lowered the nitrogen content of the grain and improved the valuation.

The geographic distribution of clover varieties in Russia [trans. title], F. F. BORISENKO (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*), 5 (1927), No. 2-3, pp. 98-112, fig. 1).—A review of the problem suggested that clover is adapted to certain climatic and soil conditions which determine its biological and cultural characteristics. The latter appear to be markedly affected by changes in environment. The natural clover regions seem to be the proper places for seed production. Selection studies have shown the possibility of obtaining clovers for specific purposes or regions, and breeding work may extend clover culture into new regions. A considerable expansion of the Russian clover area is expected within the near future.

Inheritance of smooth seeds in cotton, T. H. KEARNEY and G. J. HARRISON (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 3, pp. 193-217, figs. 10).—Crosses between smooth seeded and fuzzy seeded sorts of cotton showed that the inheritance of the character is mainly of a simple Mendelian type. The factor for smooth seeds in Egyptian (Pima) cotton, although recessive to the factor for fuzzy seeds in upland cotton, appeared dominant to the factor for fuzzy seeds in Egyptian (Pima). Different factors for smooth seeds were evident in Egyptian and in upland cotton, and the occurrence of modifying factors or intensifiers for fuzziness was also indicated.

Crosses involving members of a Pima family homozygous for both smooth seeds and normally spotted petals and members of another Pima family homozygous for both fuzzy seeds and almost spotless petals demonstrated complete independence of the characters, smooth and spotted. Crosses made by W. W. Ballard between an upland cotton having fuzzless seeds and sparse lint and another upland having entirely fuzzy seeds and abundant lint gave evidence of complete or nearly complete linkage of fuzzless seeds and sparse lint.

Soil temperature studies with cotton.—II, The relation of soil temperature to the germination and growth of cotton, A. F. CAMP and M. N. WALKER (*Florida Sta. Bul.* 189 (1927), pp. 17-32, figs. 8).—Experiments on the germination of cotton at soil temperatures between 19 and 40° C. in the soil temperature tank described on p. 208, showed an optimum of approximately 33.5° (92.3° F.), and no germination was obtained at 40° or at 14° or below. Between 15 and 35° the rate of germination agreed well with the Van't Hoff rule. Under the experimental conditions some environmental factor other than temperature appeared to largely limit the growth of cotton seedlings between about 20 to 35°, temperature being a limiting factor only above or below that range. The usual planting period, March 25 to April 5, appeared to be about as early as strong germination of cottonseed could be expected.

How cottonseed deteriorates through moisture, J. MALOWAN (*Oil and Fat Indus.*, 4 (1927), No. 4, pp. 127-130).—Excess moisture, the chief cause of the deterioration of cottonseed, is generally acquired in the fields before picking, although seed sometimes become wet through storage in sheds with leaky roofs or shipment in faulty freight cars. Field damaged seed retain the prime color, while storage damaged seed are discolored. While both types yield oil higher in free fatty acids than prime seed, field damaged seed will never produce as poor an oil as some storage damaged seed.

The danger line for moisture is around 10 per cent, although conditions will determine whether seed with that moisture content will heat. Conditions con-

ductive to heating, between 10 and 12 per cent moisture, include storage of seed into large piles as soon as ginned; warm and damp weather continued for several days; a leaky roof; a steam pipe too near the pile; and impurities, such as trash bolls and mashed seeds. Drying before storage seems the best and safest way to handle too moist seed. Other aspects of the problem treated by the author have been summarized by Steece (E. S. R., 56, p. 436).

A study of certain physical and chemical characteristics of flaxseed and of linseed oil, A. L. BUSHEY, L. PUHR, and A. N. HUME (*South Dakota Sta. Bul.* 228 (1927), pp. [2]+11).—With flax harvested August 25 and 31, September 10 and 21, and October 1, the weight per bushel and weight per 100 seeds increased consistently up to September 21, or complete maturity, whereas the actual specific gravity of the seed decreased from the earliest to the latest date of harvesting. The average percentage of oil increased regularly from the first to the last cutting. The iodine numbers, however, appeared to vary inversely with the oil content. Early harvested seed would have a lower oil content but the oil would possess better drying qualities. The average percentages of nitrogen and sucrose decrease with maturity.

The oil contents of nine varieties ranged from 33.9 per cent in common and 34.3 in Primost to 37.4 per cent in Damont. Differences in oil content of flaxseed could not be attributed to the cropping system, nor was there much variation in the oil content of seed from different planting dates.

The economic status of hemp in Germany [trans. title], J. FREUDENTHAL (*Faserforschung*, 5 (1926), No. 2, pp. 61-146).—An extensive discussion of hemp as a textile fiber plant, its distribution in Germany and elsewhere, production in Germany, the retting industry and the politico-economical importance of German hemp production. A bibliography is appended.

The Jerusalem artichoke as a crop plant, D. N. SHOEMAKER (*U. S. Dept. Agr., Tech. Bul.* 33 (1927), pp. 32, figs. 4).—Information presented on the Jerusalem artichoke (*Helianthus tuberosus*) is concerned with its history, distribution, and adaptation, uses, disadvantages, production and storage practices, diseases and insect pests, varieties, analyses as to sugar contents of tubers of Jerusalem artichoke grown at Arlington, Va., and improvement work. The bibliography includes 132 titles.

[Peanut production in Gambia], A. J. BROOKS (*Gambia Dept. Agr. Ann. Rpt.* 1926-27, pp. 7-13, 14-21, 30-35, 50, 52, 53, pl. 1).—Similar to the preceding report (E. S. R., 56, p. 736), these pages describe the results of fertilizer and variety trials and analyses with peanuts and review the status of the industry in the colony.

A critical study of some of the factors concerned in measuring the effect of selection in the potato, J. R. LIVERMORE (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 10, pp. 857-896, fig. 1).—Some of the more obvious sources of error in interpreting results of selection experiments with potatoes were studied at Cornell University.

According to data from three seasons, chance being allowed free rein, there was no significant difference in the yield from one half of a tuber compared with the yield from the other half.

In a study of the effects of missing hills, computation by the percentage difference method resulted in values much higher than by the actual difference method. The latter method seemed to give results more nearly representing true values. It is estimated that the yield of the two hills adjacent to a single hill skip is increased at least 40 per cent and possibly more because of the skip, and similarly that the yield of the two pairs of hills adjacent to a double hill skip is increased at least 75 per cent and possibly more. The effect of

missing hills appears to be markedly influenced by soil and climatic conditions, whereas variety and size of seed piece are not so important in this respect. In the author's opinion less error will be made in potato field trials of any sort if the effect of missing hills is disregarded entirely.

Observations on the effect of increasing plat size and of replication on experimental error led to the conclusion that under conditions similar to those of the experiment single row plats about 36 ft. long and replicated four times will give a reasonable degree of accuracy in comparative field trials with potatoes.

Varietal experiments with potatoes, 1918-1926 [trans. title], A. P. LUNDEN (*Årsberet. Norges Landbr. Høiskoles Åkervektforsøk*, 37 [1925-26], pp. 65-86; *Eng. abs.*, pp. 85, 86).—Continued studies (E. S. R., 40, p. 631) at the College of Agriculture, Aas, Norway, during the above years indicated the worth of Marius, Louis Botha, and General Cronje of the older sorts of potatoes for table and other uses and of King George V and Kerr Pink of the newer sorts. Other sorts were not recommended because of either late maturity or susceptibility to late blight.

Potatoes (Rothamsted Expt. Sta., Harpenden, Rpt. 1925-1926, pp. 22-24, 138-140).—Continued experiments with potatoes (E. S. R., 54, p. 437) showed that the nitrogenous fertilizers are usually the most consistent in their action, generally giving every year an increase of about 20 cwt. of potatoes per hundred-weight of ammonium sulfate whatever the season and whether manure has been applied or not. Potassium fertilizers appeared to be a good insurance against loss by spring droughts. Usually 4 cwt. each of ammonium sulfate and potassium sulfate per acre are necessary to secure the maximum crop. Economy of either nitrogen or potassium reduces the yield, but the effect depends on the season. Potassium chloride is cheaper than potassium sulfate and at Rothamsted it was found practically as effective, especially where little or no manure is applied.

The second, third, and fourth hundredweights of ammonium sulfate varied in effectiveness but were yet profitable. The returns from potassium fertilizers were usually less consistent and were much affected by season, and manure reduced their effectiveness by about one-half.

Although dealers have usually been unable to discriminate between potatoes grown with potassium sulfate and with ammonium or potassium chlorides, cooking tests have favored the sulfate. The percentage of dry matter in the tubers was highest on the unmanured plats, but was lowered by applying manure and still more by potassium along with the manure. In the absence of manure potassium sulfate has usually increased the amount of dry matter, whereas the chloride has decreased it. The proportion of starch in dry matter was much affected by seasonal factors and no consistent effect of fertilizers could be traced. Potassium increased the percentage of starch in the absence of manure and somewhat lowered it in the presence of manure, the sulfate being the more effective in the former case.

Study of the flowering habits and flower characteristics of three varieties of sugar cane, T. MERCADO (*Philippine Agr.*, 15 (1926), No. 4, pp. 181-204, fig. 1).—Observations on the Badila, C. A. C. 87, and Negros Purple varieties of sugar cane at Los Banos, P. I., showed the age of flowering to range from 289 to 428 days. The whole arrow emerged in from 8 to 11 days, and pollination commenced about 3 to 7 days after shooting. The flowers began to open about 5.30 a. m. or earlier, practically all being open before 7 a. m. On rainy days few flowers opened, but the course of opening lasted the whole day. Dehiscence of anthers started about an hour after blooming of flowers, pollina-

tion being effective only during the dehiscence period. Pollen grains, as well as anthers and stigmas, varied in size.

Of the solutions tested, chlorine water diluted with 10 to 20 parts of water and sulfurous acid diluted with 20 to 40 parts kept cane stalks with leaves fresh for 2 weeks or longer. Normal salt mixture appeared to be promising for this purpose. Although the leaves wilted in several days, they recovered and remained fresh over a month and roots developed. The fresh stigmas of the sugar cane were found the best medium for germinating pollen grains. The pollen grains decreased in viability after 2 or 3 hours. Bagging was found unsafe and unreliable for selfing sugar cane.

For the three varieties there was an average of 35,946 flowers, 107,839 anthers, and 187,190,634 pollen grains per arrow. Flowers of sugar cane appeared to be largely pollinated by wind, insects being a lesser factor. C. A. C. 87 had the most flowering stalks, while Negros Purple had the least and also produced the fewest seedlings.

Sweet clover (*Melilotus*) [trans. title], V. A. KUZNETSOV (KUZNETZOV) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 5 (1927), No. 2-3, pp. 178-186).—A botanical and ecological study of the various types of sweet clover found in Russia is described, with comment on their worth for certain regions as a cultivated crop.

Relation of the development of the wheat spike to environmental factors, T. A. KIESSELBACH and H. B. SPRAGUE (*Jour. Amer. Soc. Agron.*, 18 (1926), No. 1, pp. 40-60, figs. 4).—The relation of spike development in wheat to cultural and soil conditions was studied at the Nebraska Experiment Station. The progressive development of the growth of the spike under normal conditions is traced. The observations on environmental factors may be summarized as follows:

Adverse environmental and cultural conditions, e. g., severe pasturing, thick rates and late dates of seeding, low soil fertility, and low soil moisture, cause reduced vegetative growth and lower yields of grain.

Yield of grain per acre is an expression of the combined factors of number of spikes per unit area, number of grains per spike, and average weight of kernels. The number of spikes per unit area is affected by the number of plants and the rate of tillering. The number of plants normally depends on the rate of planting. Tillering decreases under the adverse conditions mentioned. The number of grains per spike depends upon the number of its fertile spikelets and the number of grains per fertile spikelet. In these studies this factor was increased with delayed seeding but decreased with the other adverse conditions. The average kernel weight decreased with most of the adverse conditions but was little affected by soil fertility.

Adverse soil conditions tending to stunt growth reduce the straw yields more than the grain yields. Environmental conditions which reduce vegetative growth generally cause a reduction in tillering, culm and spike lengths, number of fertile and total spikelets per spike, grains per spike, grain and straw yields, average kernel and culm weights, grains per fertile spikelet, and percentage of fertile spikelets, and cause an increase in number of sterile spikelets, in spike length: culm length ratio, in number of fertile, sterile, and total spikelets per inch of culm, and in percentage of sterile spikelets.

Inheritance of winter hardiness and growth habit in crosses of Marquis with Minhardi and Minturki wheats, H. K. HAYES and O. S. AAMODT (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 3, pp. 223-236).—The inheritance of growth habit and cold resistance was studied at the Minnesota Experiment

Station in the F_1 to F_4 generations of crosses of Marquis spring wheat with the winter wheats Minturki and Minhardi.

Spring growth habit and low cold resistance appeared to be dominant over winter growth habit and high resistance to cold. Winter hardiness was doubtless the results of cold resistance. Close correlation was observed between growth habit and cold resistance, although the linkage relation was not absolute. It seemed probable that cold resistant types capable of heading when spring sown were the result of a recombination of genetic factors for spring habit of growth obtained from Marquis with factors for cold resistance from the winter wheat parents.

The nitrogen content of new hybrids of wheat [trans. title], JAVILLIER and S. IMAS (*Compt. Rend. Acad. Agr. France*, 13 (1927), No. 9, pp. 301-304).—Determinations made on 22 wheat hybrids obtained from L. Blarlinghem showed nitrogen contents ranging from 1.96 per cent in *Triticum polonicum* \times [*T. monococcum* \times *T. durum*] to 2.71 per cent in [*T. polonicum* \times (*T. monococcum* \times *T. durum*)] \times [*T. monococcum* \times *T. durum*], and in *T. monococcum* \times *T. durum*. Several other crosses involving *T. polonicum*, *T. monococcum*, and *T. durum* also were high in nitrogen. The nitrogen contents of crosses between *T. turgidum* and *Secale cereale* ranged from 2.1 to 2.42 per cent.

Seed production and marketing, J. F. COX and G. E. STARR (*New York: John Wiley & Sons; London: Chapman & Hall*, 1927, pp. XVIII+450, figs. 193).—A popular presentation of the several phases of the production and marketing of field crop and vegetable seed.

Weeds and their effect on crop yields, E. S. HOPKINS (*Canada Expt. Farms, Div. Field Husb. Rpt. 1926*, p. 37.).—Russian thistle, the most economical in the use of water of all the plants studied, requires about one-half the water needed by wheat, stinkweed about 30 per cent more than wheat, and tumbling mustard about 70 per cent more. At Swift Current, Saskatchewan, Russian thistle and stinkweed seeds were seeded with wheat in the proportion of one weed to two grain seeds, the plants were allowed to grow together, and the grain yield was then compared with that from clean land. While about the same quantity of water was used in each case, the yield from the clean land was 34.6 bu. per acre, from the wheat and Russian thistle 20.1 bu., and from the wheat and stinkweed 24.5 bu. Summer fallow plowed late in the season after profuse weed growth yielded only about one-half the wheat produced on late plowed land or on unplowed land kept free from weeds.

Variation of the acclimatised species of prickly-pear (*Opuntia*), W. B. ALEXANDER (*Roy. Soc. Queensland, Proc.*, 38 (1926), pp. 47-54, pls. 3).—The distribution of nine species of *Opuntia* in Australia is indicated, with accounts of fluctuations, mutations, and apparent hybrids observed in several species.

HORTICULTURE

Some observations on root and crown bud formation in *Asparagus officinalis*, V. A. TIEDJENS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 189-196).—The abundant production of spears from asparagus roots set in pots of sterile sand again indicated (E. S. R., 54, p. 536) the important function of reserve foods in this species. The largest roots produced the largest spears to the end of the experiment. As the point of exhaustion approached the spears became smaller and more numerous and small adventitious buds were formed. Severe cutting apparently causes the asparagus plant to send up many small spears, resulting in small stalks which in turn result in small crown buds. A regional inhibition evidently established by a growing spear disappeared

following cutting, thus allowing otherwise dormant buds to develop. Secondary roots formed abundantly on all 1-year-old plants and less conspicuously on 2-year-old plants.

Influence of cutting asparagus the first year after planting on production the following year, H. A. JONES and W. W. ROBBINS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 23-25).—That no injury is done under California conditions in cutting a light crop from asparagus plants the year following setting was shown in studies with the Palmetto variety at University Farm. In the 2 years succeeding planting the early harvested plot yielded at the rate of 300 and 2,046 lbs. per acre as compared with 0 and 1,940 lbs. for the delayed lot. Not only was a first year crop secured, but there was also a slight difference in favor of the early harvested lot in the second season.

Influence of desiccation and root pruning on performance of asparagus, H. A. JONES and W. W. ROBBINS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 26-28).—Three lots of asparagus plants, (1) dug February 5, 1924, and allowed to stand in burlap sacks for about 50 days in a dry room, (2) dug February 5, the fleshy roots pruned to a length of approximately 4 in., and replanted February 14, and (3) controls dug February 1 and reset February 3 and 10, yielded at the rate of 250, 302, and 560 lbs. per acre in 1925 and 1,868, 2,082, and 2,372 in 1926, respectively, indicating that root pruning and drying were both injurious and that prompt planting is desirable.

Sex as a factor in growing asparagus, W. W. ROBBINS and H. A. JONES (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 19-23, fig. 1).—Approximately 58 per cent of asparagus plants resulting from seed sown at University Farm, California, on February 28, and March 8, 1923, blossomed by September 3 of the same year, affording an opportunity to select male and female plants for the permanent bed in 1924. In 1924, 1925, and 1926 male plants averaged 8.51, 8.4, and 8.43 spears per crown, respectively, as compared with 5.7, 5.14, and 4.69 for the females. In 1925 and 1926 the weights of spears per crown were 55.87 and 372.75 gm. for male and 42.66 and 238.78 for females. The average weights of single spears for the two years were 18.74 and 23.77 gm. for males and 21.9 and 27.73 gm. for females. Emphasis is placed upon the peculiar advantage of California in bringing asparagus into bloom the first season of planting.

A preliminary report on cabbage breeding, I. R. DETJEN (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 325-332).—The results of inheritance studies at the Delaware Experiment Station reviewed in some detail indicate that head formation and annual flower stalk development in cabbage when not complicated with other factors behave like simple dominants in both the first and the second generation. If present in a single plant the expression assumed is apparently covered by the factor carrying with it early maturity. The season of cabbage plants is governed apparently by a multiple factor which reveals itself in an unbroken series of stages of development of head or of the flower stalk.

Direct effects of pollen on fruit and seeds of melons, J. T. ROSA (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 243-249).—In crosses at the California Experiment Station involving several varieties of melons no evidence was found of any effect of pollen upon flesh color, skin color, ribbing, netting, flavor, or aroma. Time of ripening and the shape of fruits were also not influenced, but there was some evidence that fruits resulting from crossing were slightly heavier than from selfing. No difference was found in the average weight of the individual seeds, but the number of seeds per fruit was in several instances significantly greater in crossed fruits. Heterosis, if present, was apparently masked by the heavy seed coats.

Methods used in growing peas for canning in Maine and the problems connected with their economical production, M. D. JONES (*Maine Univ. Studies*, 2, ser., No. 9 (1927), pp. 80, figs. 10).—Herein are presented the results of a study of the history and of a survey of the present status of the pea canning industry in Maine, of methods now being used in producing the crop, and of the effect of certain practices on the yield of shelled peas. Lime is apparently beneficial, applications approximating 1,500 lbs. per acre being most profitable. Manure is more beneficial when applied to the preceding crop than when used directly on the peas; in fact, no material increase in yield over unmanured fields was indicated when manure was applied directly. Chemical fertilizers have no apparent effect on yields.

The influence of temperature upon the growth and yield of garden peas, V. R. BOSWELL (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 162–168).—Observations at the University of Maryland upon the behavior of peas planted at frequent intervals showed very little, if any, correlation between the total hour degrees of heat above 40° F. and the time required to reach blossoming. In a given season it was apparent that blooming occurred upon the reception of a fairly constant amount of heat, regardless of time. In general, as temperatures rose yields declined rapidly, the loss being largely in less pods rather than in the number and weight of peas per pod. High temperature apparently was harmful at any stage of development and is considered the most potent factor influencing growth and yield.

Winter forcing of rhubarb, C. B. SAYRE (*Illinois Sta. Bul.* 298 (1927), pp. 53–76, pl. 1, figs. 6).—Under controlled conditions, 59° F. was found the most successful temperature for forcing rhubarb. Below this point growth was slow and the skin color too dark, and above 59° color was too light and the yields lessened. No marketable stalks were obtained at 77° or above. In respect to the influence of age, 1-year roots produced light colored stalks and smaller yields than did older roots, the maximum production being reached at 3 years. Preliminary freezing was found essential, but severe freezing proved injurious. Two weeks at 20° followed by a rest period of 4 weeks at a moderately low temperature was satisfactory for forcing and as effective as 6 weeks of continuous freezing. In general, the longer the rest period the larger the yields and the more rapid the growth.

Records taken on the yields and quality of the product of two comparable lots of 5-year-old roots, one watered during forcing and the other simply set in moist soil showed the advantage of abundant watering, the watered plants yielding more than three times as much marketable rhubarb.

Ripening and storage of tomatoes, J. T. ROSA (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 233–242, figs. 3).—Of four gases tested at the California Experiment Station as media for hastening the maturity of tomatoes, propylene proved most effective, closely followed by ethylene. The other two, ethylene dichloride and ethylene chlorhydrin, did not hasten maturity, the latter being injurious and resulting in the pitting of the fruits. Starch decreased rapidly during artificial ripening, but the increase in sugars was very slight. At 25° C. (77° F.) ripening was most rapid, and the maximum sugar content was reached in about 4 days in fruits picked when partly colored. Raising or lowering the temperature above or below 77° retarded coloring. A temperature range of from 54–59° F. was found most beneficial for tomato storage when both retardation of ripening and ultimate quality were considered.

Studies of tomato quality and the effect of temperature on storage losses, J. H. MACGILLIVRAY (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 208–214).—Observations at the Indiana Experiment Station upon tomatoes harvested

when fully ripe and placed in contrasting temperatures showed a gradual continuous loss in weight and in organic constituents proportional to the temperature and the length of storage. The rate of loss was also dependent on the condition of the fruits, whether sound or cracked. At low temperatures acids were lost more rapidly than sugars, a situation which soon affected the quality of the fruits. On account of the rapid loss in quality it is advised that tomatoes be marketed as promptly as possible and in the interim should be held at relatively low temperature.

Fertilizers and cover crops on soils in the irrigated orchards of Washington. O. M. MORRIS (*Washington Col. Sta. Bul.* 217 (1927), pp. 37).—Investigations in various fruit regions showed that in orchards on good soil receiving a fair supply of water and growing permanent legume cover crops, such as alfalfa, fertilizers of no kind were effective. Similar results were observed in orchards suffering from a lack of water, and to a lesser extent in orchards on very gravelly or shallow soil where the roots suffered from competition with one another. However, in the case of a clean cultivated, well watered orchard located on silt or sandy loam when the trees were making little growth and the foliage was light green nitrogen bearing fertilizers usually gave favorable results. Phosphorous and potash, on the other hand, showed no significant benefits.

Mulches of alfalfa or clover hay gave good results in promoting growth but introduced a fire hazard. The temperature of the soil beneath mulch was lower and the moisture was increased. The soil temperature on bright days was considerably higher in the case of the clean cultivated soil. Of various species utilized as cover crops, alfalfa was most popular. Correlating germination with soil temperature it was found that alfalfa and Hubam clover were favored by a relatively warm soil and field peas and spring vetch by a cool soil. Spring vetch and field pea roots grew rapidly and were found 13 and 14 in. below the surface 5 weeks after planting as compared with 6.5 in. for alfalfa. Cover crops improved the physical condition of the soil and rendered it more pervious to irrigation water.

The effect of oil sprays upon the transpiration of some deciduous fruits. V. W. KELLEY (*Amer. Soc. Hort. Sci. Proc.*, 28 (1926), pp. 321-325).—In studies at the Illinois Experiment Station apple, pear, peach, plum, and cherry shoots in leaf all showed marked reduction in transpiration rate, as high as 75 per cent in some instances following covering with oil sprays. Since sprays applied to the upper surface alone had but little effect on transpiration, it is believed that oil in some way interferes with stomatal behavior, an assumption further borne out by the fact that the stomata of oil sprayed apple leaves did not open to as great a degree as those of untreated foliage. The author believes that oil in some manner affects the turgidity of the guard cells, perhaps by a reduction of sugars.

The interference with transpiration was greater in mature than in younger leaves, greater in day time than at night, and greater on clear than on cloudy days. In some cases the effect of the oil on transpiration was noted within 30 minutes after application.

An account of an experiment with piece root grafts in the apple and pear and of the influence on growth of the position of the top bud of the scion relative to the graft union. H. D. BENNETT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 255-259).—No significant differences were noted in pear and apple grafts, whether the root piece was from the crown, middle, or base of the seedling. In the apple the crown piece grafts started somewhat more quickly and gave a larger survival but were not superior in growth. In the pear,

grafts from the basal portion were fully as successful as those from the crown piece. Contrary to the results obtained by Roberts (E. S. R., 53, p. 843), no evidence was obtained to indicate that the position of the apical bud of the scion had any significance either in apple or pear upon survival or first year growth of the grafts.

Field observations in pollination in 1926, J. OSKAMP (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 48-51).—That difficulties in fruit setting often hastily ascribed to imperfect pollination may be due to other causes was suggested in field observations by members of the pomology staff of Cornell University. For example, the introduction of blossoming branches of several varieties and of bees into a mixed Rhode Island and Wealthy orchard failed to stimulate setting in the Rhode Island except in certain filler trees which had been severely pruned. In another instance fertilizing with nitrate of soda, pruning, and the introduction of Seckel and Kieffer blooms² failed to stimulate setting the first season in an isolated block of 14-year-old Bartlett pears.

Cross pollination studies with the Delicious apple, W. E. WHITEHOUSE and E. C. AUCHTER (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 157-161).—That the Delicious apple is almost completely self-sterile but may be satisfactorily pollinated by a large number of other varieties was shown in studies at the Maryland Experiment Station. Of 14 varieties of pollen applied to a screened Delicious tree, Winesap and Delicious pollen alone failed to induce fruit setting. In controlled crosses on Delicious blooms good sets were obtained under glassine paper sacks, while practically no set was secured under yellow paper, suggesting that Delicious blooms may be unusually sensitive to changes in light and other environmental factors.

Some factors of importance in fruit setting studies with apple varieties, F. S. HOWLETT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 307-315).—Studies at the Ohio Experiment Station showed that in certain varieties, particularly those of the Winesap group, a large proportion of the lateral flowers on the cluster are unable to set, irrespective of proper pollination and abundant nutrition. In Stayman Winesap and Arkansas Black two-thirds or more of the fruits remaining after the first drop were in the central position of the clusters. In Winesap a large percentage of both central and lateral flowers were incapable of setting, but the proportion of lateral blooms to set was larger than in Stayman Winesap and Arkansas Black. On Arkansas (Mammoth Black Twig) nearly all the fruits were laterals, although the actual percentage set of central flowers was higher. Similar behavior, but to a lesser degree, was observed in Delicious and in Rhode Island.

It is pointed out that this situation should be taken into consideration in interpreting the results of pollination studies. The failure of the flower to set fruit may in some cases be due to abnormalities in the embryo sacs. It is suggested that varieties showing this abnormal behavior should be kept in a vigorous growing condition. Sufficient bees should be present to insure pollination of the remaining blossoms.

A suggestion of a safer method for determining the relative value of cross and self-pollination in the apple, C. B. WIGGANS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 297, 298, fig. 1).—The individual flowers of a single cluster were used for determining the comparative fertilizing values of various pollens.

Varieties of apples in Ohio, II, C. W. ELLENWOOD (*Ohio Sta. Bul.* 411 (1927), pp. 64, figs. 2).—Supplementing an earlier bulletin (E. S. R., 35, p. 40), herein are described 155 varieties of apples, together with comments upon origin, uses, and value. A group classification of apple varieties is presented.

Soil moisture studies in an apple orchard, W. A. RUTH (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 300-307).—Soil moisture determinations taken in August in a 12- to 13-year-old apple orchard, trees 30 by 30 ft., located at Olney, Ill., showed considerable variations in the 3- to 6-in. soil layer in respect to the place of sampling. With one exception among the 18 comparisons possible around individual trees, the moisture content on the south side was lower than that on the other three sides, the extreme differences exceeding 10 per cent. No consistent differences were apparent between the other three sides. Long-continued rains were apparently required to wet the soil to any considerable depth. As a practical remedy it is suggested that the soil on the south side might be heavily mulched.

Soil moisture and tree growth relationships, J. OSKAMP (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 269-277).—Soil moisture determinations taken at Cornell University in three single Jonathan apple tree plats 20 ft. square, isolated by trenches and drains and differentiated in cultural treatments as follows, (1) soil covered with water proof paper, (2) soil tilled, and (3) same as (2) but with the tree cut off at the ground, failed to show any material differences. This was also the case in a fourth plat in which weeds were allowed to grow after June 15. The Jonathan tree in the covered soil made normal growth, fruited normally, and apparently obtained sufficient moisture from the original supply and from capillary action. The majority of the roots were found in the second foot of soil.

Comparing the behavior of apple trees in soil management studies at Laurel, Ind., with the behavior of apple trees in New York, the author concludes that in the East, because of greater humidity and more abundant rainfall, soil moisture is much less a limiting factor.

The effect of shade on the growth, fruit bud formation, and chemical composition of apple trees, E. C. AUCHTER, A. L. SCHRADER, F. S. LAGASSE, and W. W. ALDRICH (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 363-382).—Young bearing Stayman Winesap trees covered at the Maryland Experiment Station for two successive growing seasons with muslin bore larger, thinner leaves with less dry matter and which dropped 2 weeks earlier than those of control trees. The percentage set of fruit was reduced and fruit bud formation inhibited. The terminal growth of the shaded trees was longer, more slender, and often curled or twisted and subject to winter injury. The spur growth was also weak. Continued shading resulted in a lower starch content in the terminals and spurs.

Where halves of Stayman Winesap and Grimes trees were shaded similar results were obtained in the covered portion, indicating that there was little, if any, cross translocation of carbohydrates. As a practical deduction, it is suggested that the shaded conditions in the interior of trees are unfavorable to fruiting and should be remedied by pruning.

Preliminary studies of commercial forms of nitrogen fertilizers applied to Winesap apples, R. S. MARSH (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 218-221).—Each of three materials, nitrate of soda, ammonium sulfate, and calcium cyanamide, applied in early spring to 26-year-old sod-grown Winesap apple trees increased on the basis of dry weight the percentage of total nitrogen in the bearing spurs collected at the time of bloom and also in the bearing and nonbearing spurs taken at the end of June. Nitrate of soda gave somewhat greater increases than either of the other two substances. Analyses of spurs from trees fertilized on May 19 failed to show the superiority of nitrate of soda over ammonium sulfate, the latter in this instance being in the lead in respect to effect on total nitrogen content. No outstanding differences

were noted between the nitrate of soda and ammonium sulfate trees in leaf size or color. The leaves of the calcium cyanamide trees were, however, small.

The nitrogenous metabolism of *Pyrus malus*, W. THOMAS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 73-80, fig. 1).—Studies at the Pennsylvania Experiment Station upon the seasonal distribution of nitrogen in the leaves, 1 year, 2 year, and older growth, and in the short nonfruiting spurs of apple trees indicated that the seat of the reduction of nitrates is located chiefly in the fine roots and that the course of absorption and transformation of the nitrate radical may be followed by adopting refined methods. A close parallelism was found between the total water soluble and the free amino nitrogen throughout the year in all tissues. The "rest" nitrogen consisting of unclassified compounds increased rapidly in the leaves and branches during the fall period of nitrogen storage, suggesting the possibility that unknown nitrogen fractions may play a significant rôle in the tree's metabolism.

The effect of acid hydrolysis upon a hemicellulose reserve in apple trees, D. BRADBURY and R. H. ROBERTS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 298, 299).—Treatment with hydrochloric or sulfuric acid following extraction with ether, hot alcohol, and pyralin digestion of free hand sections and ground tissue samples of yearling apple stems showing abundant wall thickening left the wall thickening apparently intact, suggesting to the authors that the hemicellulose reserve material of apple wood is not being measured by present methods of hydrolysis.

The influence of fruiting on the catalase activity of the bark of apple trees, A. J. HEINICKE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 263-269, figs. 3).—Determinations at Cornell University at monthly intervals throughout the growing season of catalase activity in bark of young branches of bearing and nonbearing Baldwin, Wagener, and Oldenburg trees and in the bark of bearing and nonbearing branches of single Wealthy trees showed in general that fruiting tends to reduce catalase activity. During the latter part of the season catalase activity was apparently associated with the size of the crop, the heavier the crop the slower the activity. Gain in girth and high catalase were also correlated.

In the case of the Wealthy, nonfruiting limbs of a single tree invariably showed greater catalase activity than did the fruiting limbs. Vigorous fruiting limbs showed rather high activity, indicating the possibility of having approximately the same catalase activity in fruiting as in nonfruiting wood.

The influence of the earth floor upon the humidity of common storages and the resultant keeping quality of fruit, L. M. MARBLE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 315-321, pls. 3, figs. 3).—Studies of the effect of introducing dry air once in 24 hours, once an hour, and 4 times per hour into desiccators in which Wagener, Baldwin, and Northern Spy apples were stored gave unsuccessful results because of the respiration moisture. With the Baldwin, even with one change per day the average humidity was 96 per cent. Northern Spy and Baldwin kept in good condition in the desiccators until February 20, while Wagener completely disintegrated.

Records taken on the weight loss of Baldwin apples stored in a bank cellar and in an above-ground chamber showed in February losses of 5.5 and 3.35 per cent, respectively. The average humidities were 74.2 and 85.6, respectively. Visible shrinkage was not apparent in either lot by February 20, indicating that for apples sold during the early part of the storage season quite wide differences in humidity relationships may be tolerated. However, in April and early May the above-ground stored apples were noticeably in better condition. The

lower humidity of the bank cellar was believed due to the absorption of moisture by the earth floor, which remained dry throughout the entire period. The temperature of the bank cellar was lower in late fall and higher during the winter than that of the above-ground compartment.

Is phloridzin present in the pear tree? F. B. LINCOLN (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 249-252).—Contrary to results of other investigators, phloridzin was not found at the California Experiment Station in the pear tree and is believed to be specific to the apple as arbutin is in the pear. Phloretin, a white precipitate resulting from the hydrolysis of phloridzin, was not found in hydrolyzed solutions of pear extract, nor did selective color tests show phloridzin in extracts of pear bark. As contrasted with arbutin, which reached its maximum content in the bark of the upper half of the terminal shoots, the phloridzin content was greatest in the bark of apple roots. It is pointed out that both glucosides are particularly important because they are often mixed with the sugars.

The distribution of total nitrogen in pear trees, F. B. LINCOLN and J. P. BENNETT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 253-255).—Determinations at the California Experiment Station of the percentages of total nitrogen in the various parts of young Bartlett pear trees showed very little seasonal change when the leaves were included with the tree proper. With leaves excluded there was a marked depletion during the summer, the total nitrogen content reaching nearly one-half the winter point. Approximately two-thirds of the total nitrogen was in the above-ground portion, and the bark of the top and roots contained one-third of the tree's nitrogen. Unpruned trees had more of their weight and more of their nitrogen above ground.

The development of the peach seed in relation to thinning, M. J. DORSEY and R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 402-414).—Observations at the Illinois Experiment Station upon the development of the seed and fruit of peaches suggest that too much emphasis has been placed in the past on the relation of the developing seeds to the time of thinning. Apparently much greater quantities of nutrients were used in the flesh than in the seed. That a relatively wide range exists in the time for thinning was shown in the case of three varieties, Elberta, Carman, and Captain Ede, where the remaining fruits were practically equal in size at maturity whether thinned on May 15, 22, 29, or June 4 and 11. In another test on carefully fertilized and pruned Elberta trees no increase in average size of fruit was obtained by thinning, with a consequent reduction in total yield as compared with control trees.

Some pollination difficulties in cherry production, G. L. PHILP (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 28-30).—The fact that pollen from different Black Tartarian trees applied to emasculated pistils of a single Napoleon tree gave sets ranging from 1 to 35.4 per cent, despite the fact that the pollen germinated satisfactorily in a 12 per cent cane sugar solution and gave satisfactory sets on other varieties, is deemed explicable only on the basis of distinct types or strains within the Black Tartarian variety. Pollination difficulties could be overcome by propagating from trees of proved compatibility. The Abundance cherry, found inter-fruitful with Napoleon, is recommended as a desirable companion for this variety because of the close resemblance in fruit characters.

Fruit-bud and flower development in Ficus carica, I. J. CONDIR (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 259-263).—Accompanying a general discussion upon the flowering and fruiting habit in various figs, the author reports that experiments at Fresno, Calif., upon the effect of removing the terminal buds in early spring show great variation in the response of different varieties.

On branches of caprifig trees the development of profichi figs was apparently unaffected, and no marked effect was noted in the Dauphine, Madeleine, and Bourjassotte Blanche varieties. On the other hand, in the White Adriatic terminal bud pruning caused the fruit buds which normally form abundantly but abscise to cling and to develop into clusters of large edible figs.

The Kadota fig, I. J. CONDIT (*California Sta. Bul.* 436 (1927), pp. 1-2, figs. 12).—The author discusses production in California, taking into consideration the introduction of this variety, methods of planting, culture, pruning, irrigation, handling the crop, costs of production, composition of the fruit (including analyses by W. V. Cruess and F. W. Albro), etc. Caprification, though not essential to fruit production, results in a larger, meaty, green colored fig more desirable for drying but less acceptable to the canning and fresh fruit trade. The uses of Kadota fig products are noted on page 290.

The use of the growth-yield relationship in field trials with grapes, N. L. PARTRIDGE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 131-134).—The previously established relationship (E. S. R., 56, p. 142) between growth and yield of the subsequent year in the Concord grape was found at the Michigan Experiment Station to continue to further crops. Calculations of the coefficient of correlation between pruning weights and the crop were for a sandy soil vineyard 0.75 ± 0.02 , 0.73 ± 0.03 , 0.37 ± 0.05 , and 0.68 ± 0.03 for the 4 years following pruning. In a vineyard on a heavy loam soil the coefficients for the 3 years succeeding pruning were 0.58 ± 0.3 , 0.43 ± 0.04 , and 0.40 ± 0.04 , suggesting the possibility of using growth measurements as a means of selecting experimental plats, particularly in fairly uniform vineyards.

A study of the relative value of fruiting shoots arising from primary and secondary buds of the Concord grape, C. B. WIGGANS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 293-296, fig. 1).—Data taken at the Arkansas Experiment Station in the season of 1926, following a late freeze which destroyed many of the primary buds, showed primary buds to be outstandingly more productive than secondary ones. This was particularly true in the case of buds at nodes from which two shoots arose. The secondary shoots in this case averaged 50.2 per cent as many clusters per shoot, 26.7 per cent as many ounces of fruit per shoot, and the clusters weighed only 52.3 per cent as much as did those of the shoots arising from primary buds at the same node. The secondary shoots were apparently severely handicapped by competition with the primary bud shoots. Primary double bud shoots appeared more productive than primary singles, the eyes from which the doubles emanated being apparently stronger. No appreciable difference in berry size was noted.

Pruning systems [trans. title], A. LONGO (*Italia Agr.*, 64 (1927), No. 8, pp. 433-458, figs. 43).—With detailed illustrations, the author discusses the systems of pruning and training practiced in Italy in the growing of table grapes.

The better varieties of table grapes [trans. title], V. PROSPERI (*Italia Agr.*, 64 (1927), No. 8, pp. 399-423, pls. 4, figs. 28).—Illustrated in part in color, this article contains descriptive and historical material on important vinifera varieties in Italy.

Culture of table grapes [trans. title], V. RACAH (*Italia Agr.*, 64 (1927), No. 8, pp. 424-432, figs. 3).—Soils, fertilizers, spacing, methods of training, planting practices, etc., are discussed.

Production of table grapes in Italy [trans. title], F. ZAGO (*Italia Agr.*, 64 (1927), No. 8, pp. 385-399, figs. 5).—Information is presented regarding the principal production centers, preferred varieties, etc.

Tests of methods for the commercial standardization of raisins, E. M. CHACE and C. G. CHURCH (*U. S. Dept. Agr., Tech. Bul. 1* (1927), pp. 24, figs. 2).—Of several methods studied as means of quickly determining quality of raisins, a weight by volume test when supplemented with moisture, mold, and sand determinations proved most satisfactory. Specific gravity was not found to be a satisfactory means of distinguishing between grades, and sufficient chemical differences could not be established between the standard and the extra standard grades to serve as an index to quality. Moisture was determined with an apparatus designed to measure the compressibility of a given sample, mold by reaction in a 3 per cent hydrogen peroxide solution, sand by washing in water, and sunburn by a light test.

Observations on the growth habits of the strawberry as affected by fertilizer treatments, L. R. TUCKER (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 149–152).—Observations at the New Hampshire Station upon the effect of various fertilizer treatments on the growth of the Howard 17 strawberry showed the highest average number of new plants, 48.7 per mother plant, on the stable manure plat. The larger number of plants in the case of the manured plats was due mainly to a greater branching of the runners. In respect to plant size, all treatments gave practically the same results, and in almost every case the first plant on a runner was the largest. A marked reduction in the stand of plants on the areas receiving applications of chemical fertilizers indicated that commercial fertilizers increased mortality.

Bud selection in the Valencia orange: Progeny tests of limb variations, A. D. SHAMEL, C. S. POMEROY, and R. E. CARYL (*U. S. Dept. Agr. Bul. 1483* (1927), pp. 38, figs. 22).—Records taken at the Citrus Experiment Station, Riverside, Calif., on the yield and vegetable development of progeny trees representing 12 strains of the Valencia orange, the variability of which was previously discussed (*E. S. R.*, 39, p. 448), showed that the fruit and foliage characters of the parent limbs were transmitted to the progeny. Progeny trees from stable variations were stable, while those taken from unstable parents yielded both normal and abnormal fruits in the same manner as the parent. Differences in yield as well as in the characters of the fruit and leaves were transmitted by bud propagation and emphasize the need of careful bud selection in the propagation of the Valencia orange.

Rootstock reactions as indicating the degree of congeniality, H. J. WEBBER (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 30–36, fig. 1).—Field observations at the Citrus Experiment Station, Riverside, Calif., upon oranges, lemons, and grapefruit trees propagated on various stocks suggested that the degree of congeniality existing between the stock and the scion is manifested in the character of the growth at the union. Maximum congeniality is indicated when the bud union is smooth, and lack of congeniality when there is a distinct overgrowth on the part of either the stock or the scion. The closeness of genetic relationship favors a congenial union, and conversely the absence of relationship makes for an unfavorable or no union.

Citrus rootstock identification, L. BRAUCHER (*Calif. Countryman*, 13 (1927), No. 7, pp. 6, 19, figs. 2).—Based on anatomical studies, the author presents a key, using particularly the width of the medullary rays, position and amount of phloem fibers, and arrangement of the pith cells, to aid in the identification of citrus rootstocks such as the sour orange, the grapefruit, rough lemon, and sweet and trifoliate oranges.

The bulb "cooker," D. GRIFFITHS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 171–173, fig. 1).—Asserting that the immersion for 3 hours of narcissus bulbs in a water bath at 110–112° F. assists in insect and disease control and also

stimulates subsequent growth, the author describes a machine for bulb treatment.

American orchid culture, E. A. WHITE (*New York: A. T. De La Mare Co., 1927, pp. 227, pls. 8, figs. 73*).—A survey of the present status of orchid growing in the United States with respect to the location of the houses and their structure, species grown, methods employed in propagation, culture, etc.

The effect of heavy versus light pruning on greenhouse roses, T. H. WHITE (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 168-171*).—At the Maryland Experiment Station lightly pruned greenhouse grown Ophelia roses produced 13.4, 32.4, and 54.3 per cent of first, second, and third grade blooms, respectively, as compared with 11.3, 33.6, and 55.1 per cent for heavily pruned plants. The lightly pruned produced 8 per cent more blooms than the heavily pruned plants.

A little book of perennials, A. C. HOTTES (*New York: A. T. De La Mare Co., 1927, 2. ed., rev., pp. 200, figs. 91*).—A revised edition of the previously noted work (E. S. R., 50, p. 39).

Ornamental vines, H. MOWRY (*Florida Sta. Bul 188 (1927), pp. 183-230, figs. 51*).—Briefly discussing the propagation, care, climatic adaptation, and uses of ornamental vines, the author describes various important and promising species adapted to Florida conditions and presents a key to aid in identification.

Gardens and gardening (*New York: New York Pub. Lib., 1927, pp. 48, pl. 1*).—A selected list of books prepared by the Garden Club of America, the Horticultural Society of New York, and the New York Public Library.

FORESTRY

How a tree grows, W. SOMERVILLE (*London: Humphrey Milford, 1927, pp. [3]+212, figs. 112*).—A scientific discussion of the structure and manner of growth of the various parts of forest trees from the simplest root cell to the complex seed, with material added on the identification of timbers.

The effect of site on the structure and growth of white cedar *Thuja occidentalis* L., W. M. HARLOW (*Ecology, 8 (1927), No. 4, pp. 453-470, pl. 1, figs. 4*).—Noting that white cedar grows on calcareous rock supplied with abundant lime and also in peat bogs of high acidity, a study was made of the effect of these contrasting sites on the structure of the wood and the rate of growth.

The slight difference in fiber length (1.8 per cent) between the woods from the two sites was considered negligible in view of the variability existing between trees of a single site. In general fiber length was least near the center of the trees and synchronized with texture. Texture variations in wood of trees from the two sites were no greater than those between trees of the same site, a situation also true in respect to variation in ray volume. The specific gravity of white cedar wood from limestone areas was somewhat greater than that of the peat bog trees. Resistance to compression parallel to the grain was appreciably greater when uncorrected for specific gravity in trees from the limestone sites. From a comparative standpoint growth in diameter was significantly greater in limestone trees, suggesting a preference of the tree for limestone sites. Annual growth in either case was remarkably uniform.

The distribution limits of the long-leaf pine and their possible extension, H. NESS (*Jour. Forestry, 25 (1927), No. 7, pp. 852-857*).—Difficulties met in an attempt to grow long-leaf pine seedlings on a fertile clay loam at College Station, Tex., were largely overcome when thrifty 2-year-old plants were secured from nurseries in the long-leaf pine region, leading to the conclusion

that the long-leaf pine, a native of soils low in organic matter, perishes in the seedling stage when germination occurs on fertile soils. However, once established on better soils, long-leaf pines made exceptional growth and proved very resistant to severe droughts.

Variation in the rate of growth of bamboo in relation to temperature. W. M. PORTERFIELD (*China Jour.*, 7 (1927), No. 4, pp. 191-205, figs. 5).—A study of growth curves plotted for two species of bamboo, *Phyllostachys nigra* and *P. quadrangularis*, of spring and fall growing habits respectively, indicated that temperature is the controlling factor in the growth of bamboo shoots. The general slant of the growth curve was dependent on average thermic conditions, and even the hourly rate of growth varied in accordance with thermic fluctuations. Tentative ratios of day to night growth were 1.6 to 1 and 1.2 to 1 for *P. nigra* and *P. quadrangularis*, respectively.

The marginal ditch and swamp drainage for forestry. A. E. WACKERMAN (*Jour. Forestry*, 25 (1927), No. 7, pp. 848-851, fig. 1).—The marginal ditches often found surrounding swamps and forming a boundary between the swamp and the upland mineral soils are believed to be due to a more rapid decomposition in this area of peat and organic matter, caused by the oxygen, soil bacteria, and fungi entering with the upland drainage.

Measuring tree heights on slopes. R. E. MCARDLE and R. A. CHAPMAN (*Jour. Forestry*, 25 (1927), No. 7, pp. 843-847, figs. 2).—A graphical method devised for use in connection with the percentage scales for measuring the heights of trees located on steep slopes is briefly outlined.

Abnormalities in annual rings resulting from fires. F. C. CRAIGHEAD (*Jour. Forestry*, 25 (1927), No. 7, pp. 840-842, pl. 1).—An examination of the wood of western yellow pines injured in June, 1924, by crown fires to the extent of partial to complete defoliation showed a disastrous effect on subsequent growth. In a slightly defoliated tree full recovery was not attained until 1928, and in a severely defoliated specimen only a trace of new wood was found up to this time. It is suggested that forest fires may materially affect the accuracy of studies based on annual ring growth and may be the cause of apparent discrepancies in ages of individuals in even aged stands. It is deemed possible that in forests where repeated fires occur as many as 10 years' rings may be lacking in a 100-year-old stand. Supplementary comments by E. N. Munns are added.

Latex. E. A. HAUSER (*Latex. Dresden: Theodor Steinkopff, 1927, pp. XII+231, figs. 74*).—A general treatise on latex discussing early history, sources, field production, manufacture, properties, and technical uses, with an appendix by C. B. von Boernegg upon existing latex patents.

DISEASES OF PLANTS

A general text on phytopathology. N. A. NAUMOV (*Obshchii Kurs Fitopatologii. Moscow: Gosud. Izdatel.*, 1926, 2. ed., rev., pp. 504, figs. 123).—This book, the second edition of a text on phytopathology for students in agricultural institutions, is in four parts: (1) General (4 chapters); (2) descriptive (19 chapters); (3) fundamental prophylactic measures and therapy in phytopathology (4 chapters); and (4) supplement (including methods of culture of disease-producing organisms and of seed treatment) (4 chapters). Each chapter has a bibliography. There is an alphabetical index of the Latin names of host plants, and of the diseases.

Diseases of cultivated plants (*Maladies des Plantes Cultivées. Maladies non Parasitaires. Maladies Parasitaires. Paris: J. B. Baillière & Sons, vol. 1, 1927, pp. 415, figs. 106; vol. 2, 3. ed., rev. 1926, pp. 456, figs. 759*).—Earlier

editions of these volumes have been noted (E. S. R., 36, p. 645). Volume 1, by G. Delacroix, deals with nonparasitic diseases, while volume 2, by Delacroix and A. Maublanc and revised by Maublanc, deals with parasitic diseases.

Facultative parasitism and host ranges of fungi, P. A. YOUNG (*Amer. Jour. Bot.*, 13 (1926), No. 8, pp. 502-520, pls. 2).—Increasing evidence shows that many fungi which have been called saprophytes are able to enter living plants and cause diseased conditions in one or more cells, so that the group of real saprophytic fungi proves to be surprisingly small. Details and summed results are given regarding the study of a number of plants and of fungi.

Morphological and biological distinctions among plant parasitic nematodes [trans. title], H. GOFFART (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 36 (1926), No. 9-10, pp. 257-263, figs. 5).—A tabular and discussional account is given of the characters, occurrence, and host plants of nematodes of importance in connection with economic plants, in case, more particularly, of *Tylenchus dipsaci*, *T. tritici*, *Aphelenchus olesistus*, *Heterodera schachtii*, and *H. radiculicola*.

Common diseases of Colorado truck crops, L. W. DURRELL and E. L. LECLEGG (*Colorado Sta. Bul.* 323 (1927), pp. 27, figs. 15).—Brief descriptions are given of diseases of truck crops most common in Colorado, together with suggestions of methods for their control.

The wilt disease of cotton and sesamum in India, E. J. BUTLER (*Agr. Jour. India*, 21 (1926), No. 4, pp. 268-273, pl. 1).—This paper describes some hitherto unpublished work on wilt disease of cotton and sesamum carried out in 1912, and discusses briefly the relationships of some Indian wilt-producing fungi.

"The wilt-producing fungi attacking cotton, sesamum, and pigeon pea in India may, in the writer's opinion, best be considered to be strains of *Fusarium vasinfectum* Atkinson, which itself may be merely a strain of one of the earlier described species of the genus."

[Plant diseases in south and east Africa] (*So. and East African Agr., Cotton, Ent., and Mycol. Conf., Nairobi, Proc.*, 1926, pp. 200-220).—Observations and papers were contributed on some coffee pests and diseases, including principally the coffee root nematode (*Heterodera radiculicola*), leaf disease (*Hemileia vastatrix*) and its control, and dieback (exhaustion; parasitic?); Gummosis in Coconuts (various causes suggested), by E. J. Welsford (pp. 205-210); Control of Streak Diseases on Maize and Sugar Cane (pp. 212, 213), Sugar Mosaic Disease (p. 213), and Rosette Disease of Ground Nuts [Peanuts] (pp. 213, 214), all by H. Storey; and Some Factors Influencing the Occurrence and Distribution of Plant Diseases in Kenya, by J. McDonald (pp. 214-220).

Observations on some alfalfa root troubles, J. L. WEIMER (*U. S. Dept. Agr., Dept. Circ.* 425 (1927), pp. 10, figs. 4).—Some results are given of investigations carried on in cooperation with the Kansas Experiment Station on certain types of alfalfa root troubles, which are said to occur more or less commonly in different parts of the United States. Collar rot and heart rot are terms used to designate certain exterior and interior injuries to the root at and just below the crown, and from field observations these are believed to be due to a form of winter injury. Hollow crown is distinguished as a disease affecting alfalfa plants in all parts of the United States, after they attain a certain age, the age differing with conditions. Brief notes are given of a rotting of the taproots of alfalfa in the Missouri River bottom soil at Wathena, Kans., and of a somewhat similar trouble which is attributed to insect injury.

The productiveness of corn as influenced by the mosaic disease, H. F. STONEBERG (*U. S. Dept. Agr., Tech. Bul.* 10 (1927), pp. 19, figs. 7).—The symptoms of mosaic disease of corn as developed in experimental plantings at Baton Rouge in cooperation with the Louisiana Experiment Stations are de-

scribed. Data are given on the relative yield, numbers of suckers, and the numbers and quality of ears produced on mosaic-diseased and on comparatively healthy plants. The disease is said to have had no apparent effect on the rate of growth or the total height of the corn plants. The diseased plants tended to sucker slightly more and, possibly, to produce slightly more ears. The yields from diseased plants, while lower in every extensive comparison, showed a difference of less than 10 per cent. A larger proportion of the ears from healthy plants was in the marketable class, and the ears tended to be slightly better filled, but the differences were not considered important.

On the basis of the data presented it was concluded that, under the conditions described and as far as the experiments have gone, the mosaic disease was slightly deleterious to the yield and quality of corn, but it could not be considered one of the important factors in reducing corn yields.

Effect of smut on sap concentration in infected corn stalks, A. M. HURD-KARRER (*Amer. Jour. Bot.*, 13 (1926), No. 5, pp. 286-290).—It is shown that the specific gravity of juice expressed from smut-infected cornstalks bearing actively growing galls is lower than that of juice expressed from the corresponding internodes of healthy plants, this lowering of the sap concentration being often evident throughout the stalk though most pronounced in the internodes adjoining a smut gall. The specific gravity of the sap is sometimes so low in the internodes adjoining the attachment of galls as to reverse the concentration gradient in that section of the stalk.

A disease of Queensland cotton seed, C. A. PRATT (*Empire Cotton Growing Rev.*, 3 (1926), No. 2, pp. 103-111).—Diseased cottonseed from Queensland germinated to the extent of only about 70 per cent, the rest all giving rise to a *Fusarium* and showing fungal hyphae in the rotten tissues. Seed cut and plated out showed *F. moniliforme* in a ratio about equal to that of germination failure. Bacteria were obtained in all cases of failure to germinate. The dry seeds showed brown patches in about 25 per cent of the embryos, and all these cases gave the *Fusarium*.

F. moniliforme, when placed on healthy seed, does not reduce germination but does attack the seedlings. Healthy seedlings are not attacked by the bacteria. Germination is not affected by stabbing *F. moniliforme* bacteria into the seed until the *Fusarium* has reached the radicle. The results of inoculations of cotton bolls on the plants indicate that the *Fusarium* is capable of growing through the lint and into the seeds; also that the seeds thus infected are brown inside and incapable of germination. The bearing of this work on stalk, root, and ear rot of corn in the United States due to *F. moniliforme* on the cottonseed disease problem is discussed, and possible paths of infection are considered.

The two most common decays of cotton bolls in the Southwestern States, M. SHAPOVALOV (*Jour. Agr. Research* [U. S.], 35 (1927), No. 4, pp. 307-312, pls. 2).—Two forms of decay of cotton bolls, frequently referred to as smut, are described. One of these forms of decay is said to be caused by *Aspergillus niger* and the other by *Rhizopus nigricans*. It is claimed that the two diseases may be readily distinguished by the discoloration of the affected tissues, as well as by the character of the fruiting stages of the parasites. Both organisms were found to produce rot readily on artificially wounded and inoculated cotton bolls, but failed to affect uninjured bolls.

Observations on a disease of jowar (*Sorghum vulgare*) caused by *Sphacelia* (conidial stage of *Claviceps*), S. L. AJREKAR (*Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), p. 221).—The disease is ascribed to the *Sphacelia* stage of a *Claviceps*. The dark green, and sometimes whitish, bodies which

are developed in place of the affected grains are described as imperfectly developed ergot bodies, whose development has been interfered with by the fungus *Cerebella* or a yeast, respectively.

Powdery mildew of peas, R. F. CRAWFORD (*New Mexico Sta. Bul.* 163 (1927), pp. 13, figs. 4).—According to the author, powdery mildew of peas, caused by *Erysiphe polygoni*, is usually the limiting factor in the successful production of the pea crop in the mountainous sections of New Mexico. The fungus is said to live over from one season to another on and in the pea seed, and the disease can be greatly reduced by treating the seed with hot water at 56° C. (133° F.) for 20 minutes. Dusting the plants with a mixture consisting of 4 parts sulfur to 6 of hydrated lime was found to control the disease in the field. It is claimed that increased yields can be obtained by treating the seed with hot water and dusting the plants with the sulfur-lime mixture.

From a study of phenological data it is said that on account of frosts peas should not be planted after July 10 in the vicinity of Las Vegas, N. Mex. The average length of time from planting to mature pods that are ready for market is reported to be approximately 70 days.

Experiments on the control of potato leaf-roll, T. WHITEHEAD (*Welsh Jour. Agr.*, 3 (1927), pp. 169-180, pl. 1, figs. 2).—A progress report on attempts to control potato leaf roll in the field, carried on since 1923, states that roguing out diseased plants is likely to be of value only in slightly infected stocks and in areas in which the rate of transmission of leaf roll is low. No confirmation could be obtained for the view that a more healthy crop could be produced by selecting the largest tubers or those from the most vigorous plants. Some indication appeared that the smaller tubers from the less vigorous healthy plants produced the healthiest crop.

Apparently there is little danger of perpetuating leaf roll if tubers for seed are dug not later than the middle of August, so long as the crop is only slightly infected and is growing in an exposed field, and the tubers are selected from healthy plants, as far removed as possible from diseased ones.

The black-root disease of radish, J. B. KENDRICK (*Indiana Sta. Bul.* 311 (1927), pp. 32, figs. 13).—A description is given of a deeply penetrating blackened discoloration of the root tissues of the radish, the edible portions of the diseased roots being rendered unfit for table use. The disease is said to be caused by *Aphanomyces raphani* n. sp., a technical description of which is given.

The pathogenicity of the organism was repeatedly proved and of all varieties tested only the Chinese White was consistently found to be resistant to the disease. Usually the long white varieties were found most subject to injury, the red globe type often escaping. The organism is said not to be seed borne, and it is believed to overwinter in the soil. No other host for the fungus than the radish is known.

Early planting to avoid the high temperatures which favor the fungus and the use of the red globe type of radishes where the soil is badly infested are suggested as partial control measures.

Mosaic disease of sugarcane in India in 1925, W. McRAE (*Agr. Jour. India*, 21 (1926), No. 3, pp. 198-202).—An account is given of the history of sugar cane mosaic by regions and countries, of its varietal incidence, and of the influence of weather upon other diseases of the different sugar cane varieties at Pusa. It is thought that mosaic may have existed among the diseases of India for a long time.

"It seems probable that the disease originated in Hemja and passed to these new canes. The disease is probably endemic in India, and Hemja is probably tolerant."

A mosaic-like disease of sugarcane in the Central Provinces in 1926. J. F. DASTUR (*Agr. Jour. India*, 21 (1926), No. 6, pp. 429-432).—A somewhat detailed historical and descriptive account of cane mosaic and of diseases somewhat resembling this concludes "that this disease in the Central Provinces is not exactly the mosaic disease described by Brandes [E. S. R., 42, p. 449] but is the streak disease described by Storey [E. S. R., 54, p. 251] from South Africa."

Manurial and stripe disease control experiment on tomatoes, Rhyl. H. L. JONES (*Welsh Jour. Agr.*, 3 (1927), pp. 296, 297).—This experiment is said to have been undertaken at the wish of market growers of tomatoes to find the best method of controlling the locally troublesome tomato stripe disease, also to test for the best methods of manuring. The method of manuring in use was supposed to be a predisposing cause of stripe, and the results obtained seem to support that belief.

Five base treatments are detailed. Among these, the heaviest yield (with only one plant attacked, and that temporarily) was obtained by use per square yard of 1 lb. of lime, 14 lbs. of stable manure, 0.25 lb. of bone meal, 0.25 lb. of bone flour, 0.25 lb. of hoof and horn meal, and 0.25 lb. of sulfate of potash. Other treatments showing slight variations from this formula gave yields only slightly lower, with no trace of stripe.

The relative resistance of wheat varieties to bunt (*Tilletia tritici*) K. SAMPSON (*Welsh Jour. Agr.*, 3 (1927), pp. 180-196).—Of 40 pure line selections of Hen Gymro wheat studied for bunt susceptibility, none showed outstanding resistance, nor was correlation between morphological characters and relative susceptibility indicated by the results. Of 65 samples including 32 British wheat varieties, tested in one season for bunt resistance, all showed relatively high susceptibility (56-91 per cent). Martin and Hussar, both immune to *T. tritici* in America, appear to be completely resistant also to bunt in Wales. White Odessa, Rudit, and Turkey, also varieties of *Triticum vulgare* which have shown high bunt resistance in America, proved to be relatively resistant in these trials. Hells Dickkopf, a variety which has shown resistance to bunt in Germany, was relatively resistant to bunt in Wales. Florence, Hells Dickkopf, and Pommersche developed a considerable proportion (33 to 45 per cent) of healthy grain among the bunted grains of infected heads. In most varieties the invasion of infected ears was complete.

The experiments indicate the need for improving British varieties as regards bunt resistance, and they suggest the possibility of introducing resistance by crosses with the immune varieties Hussar and Martin. The behavior in Wales of certain foreign wheat varieties of known bunt resistance supports the view that *T. tritici* is not a fungus with many highly specialized biological species.

Diseases of fruit trees and bushes. R. EWERT (*Die Krankheiten der Obstbäume und Obststräucher. Berlin: Paul Parey, 1926, 2 ed., rev., pp. 145, figs. 63*).—The present edition of this work (E. S. R., 29, p. 640) adds a chapter on diseases of currant bushes and one on diseases of gooseberry bushes.

On "burr-knots" of fruit trees. R. G. HATTON, H. WORMALD, and A. W. WITT (*Jour. Pomol. and Hort. Sci.*, 5 (1926), No. 3, pp. 195-204, pls. 2).—Types of fruit tree burrknots or root knots are discussed as to their incidence and the values assigned to them by horticulturists in relation to the propagation of the varieties producing them. Branches or twigs bearing burrknots when used as cuttings, the knots being covered with soil, produced roots readily from the knots. Attempts to isolate an organism gave negative results. The authors' observations are said to confirm results of recent work indicated as offering evidence that burrknots have no connection with crown gall or hairy root.

An improved method of isolating *Pseudomonas tumefaciens* Sm. and Town., M. K. PATEL (*Phytopathology*, 16 (1926), No. 8, p. 577).—In cultural and isolation studies with the crown gall organism, it was found that a small amount of sodium taurocholate in dextrose agar inhibits the development of most of the contaminating organisms but seemingly stimulates the growth of *P. tumefaciens*. The mode of preparation is indicated. Its advantages are that less drastic disinfection of the gall tissue is required, and a greater quantity of inoculum may be used; the development of the coccus forms and psychrophilic soil bacteria is inhibited by the bile and high temperature of incubation; and the growth of the Gram-positive bacteria is inhibited by the crystal violet (hexamethyl violet (chloride)).

"This method does not exclude certain bacterial colonies which have at first a close resemblance to *P. tumefaciens*, but which later seem to be quite distinct from those of the crown gall organism. *P. tumefaciens* is not inhibited, but develops as rapidly as on potato dextrose agar in pure culture.

"By this method it is possible to recover *P. tumefaciens* from gall tissue, such as apple, much more readily than by using potato dextrose agar and the small amount of inoculum usually employed in dilution plates."

Crown gall of apple nursery stock, I. E. MELIUS (*Jour. Econ. Ent.*, 19 (1926), No. 2, pp. 356-365).—Recent studies have shown that a large percentage of the knots occurring on root-grafted apple trees are due to excess callus formation at the union of stock and scion. The apple stem tumors as well as certain aerial apple tree galls are supposedly due to an inherent varietal response. Certain types of apple seedling hairy root, previously classed as crown gall, have developed in the absence of *B. tumefaciens*. In most galled trees a lack of continuity between the stock and scion is found. Such overgrowths produced by excess callus at the union in root-grafted trees reduce materially the upward flow of water.

A study of crown gall caused by *Pseudomonas tumefaciens* on rosaceous hosts, J. H. MUNCIE (*Iowa State Col. Jour. Sci.*, 1 (1926). No. 1, pp. 67-110, pls. 4, figs. 7).—Cultural studies of 196 piece-root grafted apple trees discarded at the nursery because of overgrowths at the union revealed the presence of *P. tumefaciens* in relatively few cases. By employing the early method of isolation the organism was recovered from 7 of 111 trees collected in 1924. By employing Patel's modification of this method (see above) on 85 trees collected in 1925, *P. tumefaciens* was recovered in 16 cases.

From 21 trees grown on an area from which severely galled roses has been dug 2 years previously, the crown gall organism was isolated in 16 cases. Reisolation attempts resulted negatively after 5 months in storage, when the galls had begun to decay, though inoculations from suspensions of the macerated galls yielded typical galls on tomato plants in 15 of 21 trials. From many of the overgrowths organisms were found which closely resembled *P. tumefaciens* in plate culture, but which failed to produce galls upon inoculation into tomato.

The abundant development of fibrous roots from an overgrowth at the union of piece-root grafted trees is not a reliable index of crown gall infection. In the isolations from 196 trees having overgrowths at the union, 155 showed this type of malformation, and from 16 of these trees the crown gall organism was recovered. Isolations from 50 1-year-old apple seedlings showing the fibrous type of hairy root failed to yield the crown gall organism in any case. Inoculations of tomato plants also failed.

Overgrowths closely resembling those found on discarded nursery trees have been induced upon aseptically made grafts and scion cuttings planted in

sterilized soil. Isolations from these malformations failed to yield *P. tumefaciens*. It is claimed that these overgrowths were caused by excess callus formation at the tip of the scion lip of the graft and scion cuttings, and it is supposed that most of the malformations at the union of piece-root grafted apple trees are due to the same cause. The fibrous type of hairy root developed on seedlings grown from surface disinfected seed in steamed and unsteamed field soil, as well as on seedlings from surface disinfected seed grown in artificially infested steamed soil and under natural field conditions.

The woolly knot form of hairy root occurred on seedlings from disinfected seed grown on steamed soil after *P. tumefaciens* had been artificially inoculated into wounds, or when the seedlings were wounded and the soil was infested with the pathogen. The fibrous type of hairy root is probably noninfectious. The woolly knot form is a manifestation of crown gall infection.

P. tumefaciens retains its virulence for considerable periods of time in sterilized and nonsterilized soil.

The average unit water flow through the union pieces of healthy piece-root grafted 1.5- and 2-year-old Wealthy, Jonathan, and Ben Davis apple trees was 53.4, 20.0, and 42.9 per cent less, respectively, than that through the trunk pieces of the same trees. Other reductions are indicated.

The size of gall and degree of girdling together offer an index of the interference with water conduction through the tree. The imperfect healing of the union in otherwise normal trees may cause a reduction in water flow equal to that in galled trees. Lack of continuity between stock and scion was still evident in galled piece-root grafted trees after 4, 5, and 8 seasons in the orchard. On trees showing overgrowths at the union when planted, the malformations persist at least 13 years after setting in the orchard. In a majority of cases such trees show lack of continuity at the union.

Studies of crown gall and wound overgrowth on apple nursery stock, A. J. RIKER and G. W. KEITT (*Phytopathology*, 16 (1926), No. 11, pp. 765-808, pls. 10, figs. 2).—Crown gall infection of young apple trees was readily induced when *Bacterium tumefaciens* was applied in suspension to wounds of various types (needle punctures, knife cuts, hammer blows), though in several experiments freshly produced callus on apple grafts and young trees failed to serve as an open court for this parasite. Apple crown gall shows definite characters which resemble those of peach and raspberry crown gall but disagree with those of apple wound overgrowths. Cultural studies show that *B. tumefaciens* may be consistently and easily isolated from apple crown galls in various developmental stages. The term hard gall is not distinctive, as the galls may be either hard or soft. Crown galls may be decayed by microorganisms, which may then attack the cortex and kill the tree. Crown galls may overwinter in a sound condition, and the organism has been isolated in spring from overwintered crown galls of apple and of raspberry. Many common antiseptics, including commercial preparations of hydroxymercurichlorophenol, have proved ineffective in preventing infection of tomato by *B. tumefaciens*.

Standardized cultural studies of malformations on 407 apple trees taken from several thousand received as crown gall rejects from 22 nurseries in 14 States failed to reveal the presence of *B. tumefaciens* or any organism closely resembling it in 86 per cent of the trees examined. The same technique applied to typical crown gall on apple, peach, cherry, and plum isolated *B. tumefaciens* from 70 of 73 specimens. The malformations on the rejected stock which failed to yield the crown gall organism possessed certain characters which were different from those of crown gall. Because of the relationship of wounds to their initiation and development, they are called wound overgrowths. Such over-

growths occur commonly on young apple trees following certain injuries, as in grafting wounds and in cultivation.

Differential characters of crown galls and wound overgrowths are discussed. Examinations of representative lots of commercial apple grafts showed a sufficient number of misfits to account for most of the wound overgrowths which develop in the nurseries. Under experimental conditions in which precautions were taken to exclude the crown gall organism, wound overgrowths typical of those found in commercial practice have been developed readily from poorly fitted grafts or following wounds. In the same experiments well-fitted grafts developed smooth unions. Wound overgrowths have been controlled in experimental plats without the use of antiseptics, important factors in this connection being avoidance of the use of scions of greater diameter than the stock; proper fit at the lower scion tip; tight wrapping with a material which forms a sufficiently strong bandage about the union, so as to maintain its strength throughout the critical period for callusing, but rotting before exercising an injurious girdling effect; prevention of excessive callus development in storage; and avoidance of injuries during cultivation. Wax and certain antiseptics have been found to exert a marked preservative effect on various wrappers commonly used in grafting work, and it is thought that such materials may indirectly play a considerable part in controlling wound overgrowths. Some of the antiseptics employed have also reduced wound overgrowth resulting from injury to the lower scion tip and callus. A survey made in representative nurseries showed that crown gall on apple was widely distributed, but that it was much less prevalent than the wound overgrowth, which was found to be commercially controlled on apple in three nurseries where appropriate grafting methods were used and quite generally where the stock was propagated by budding.

A summary of the results of the cooperative investigation of crown gall in relation to apple nursery stock, I. E. MELHUS (*Crop Protect. Digest*, No. 11 (1926), pp. 1-3).—A summary of the most important results of these researches noted in the 3 preceding abstracts is given.

The migration of *Bacillus amylovorus* in apple tissue and its effect on the host cells, E. L. NIXON (*Pennsylvania Sta. Bul.* 212 (1927), pp. 16, pl. 1).—Of the known forms of fire blight, blossom blight, twig blight, canker blight, collar blight, and root blight, the author presents the results of his studies on twig blight and canker blight, beginning with the earliest needle-point infection of the water sprout and tracing the invasion through to canker formation.

B. amylovorus is said to migrate through the apple tissue in the form of a zoöglöea. In the early stages the most extensive migration is intercellular. Due to the action of the organism, two distinct types of ultimate injury result; the formation of schizogenous and lysigenous cavities.

In the life cycle of *B. amylovorus*, there are said to be two phases or periods, a vegetative stage and a pseudofructification. The major portion of the intercellular migration in the form of zoöglöea is said to comprise the vegetative phase, while the intracellular migration with, ultimately, the formation of cysts is said to characterize the pseudofructification phase. The cysts represent the winter condition of the bacteria. The author states that in these respects the life history of *B. amylovorus* is quite similar to the lower forms of the myxobacteriaceae.

The spotting of Jonathan apples (Jonathan spot) [trans. title], A. OSTERWALDER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 9-10, pp. 264-269, figs. 5).—Attempts to place, systematically, the causal organism of apple Jonathan spot met with no decided success.

Spraying for prevention of apple blotch and apple scab, F. H. BALLOU and I. P. LEWIS (*Ohio Sta. Bul. 413* (1927), pp. 32, figs. 13).—The results are given of a 5-year spraying experiment to compare standard Bordeaux mixture, 3-9-50, with standard lime-sulfur solution, 1-40, for the control of apple blotch (*Phyllosticta solitaria*) and apple scab (*Venturia inaequalis*). Other formulas than those mentioned were also tested.

A thoroughness of application of any fungicide was found to be of prime importance, and the efficiency of lime-sulfur spray was demonstrated. Commercial dry or powdered lime sulfur not only equalled the liquid form, but it did not cause so much injury to foliage and fruit when sprayed during hot weather.

In 1926 a form of foliage injury was found to be unusually severe in a plat of Rome Beauty trees sprayed in the pink stage with a 1-40 commercial liquid lime-sulfur solution. The trees all season through failed to regain normal vigor and appearance, and the fruit was injuriously affected. An adjoining plat of trees sprayed with a 3-50 dry lime-sulfur solution at the time the fruit buds were first showing pink tips showed no evidence of interruption to foliage development, and the fruit was comparatively large and of better color and smoother finish.

The lowest average percentages of sound, blotch-free apples from the use of the entire group of standard lime-sulfur sprays applied at the critical period for control of blotch were 95.1, 96.2, 97.8, 98.8, and 99 as compared with an average of 11.3 per cent of sound fruit from check trees from the same 5-year period. The two forms of lime sulfur used in experiments for the control of apple scab gave high percentages of fruit free from disease. In effectiveness, these treatments were fully equal to the 3-9-50 Bordeaux mixture, and the fruit was much better in color and finish than that produced by the trees receiving the copper sprays. The 5-year average percentages of scab-free apples from the various lime-sulfur sprays ranged from 84.7 to 96.9 as compared with 10.04 per cent of sound fruit on unsprayed trees.

In experiments with Bordeaux mixture, effective control of apple blotch and apple scab was secured even when the copper sulfate was reduced almost to the point of elimination. There was practically no difference, so far as apple blotch prevention was concerned, in the results obtained from the use of Bordeaux mixtures ranging from 3-9-50 to 0.75-2.25-50. The strongest solution gave a 5-year average of 99.5 per cent, and the weakest 98.6 per cent of sound apples, as compared with untreated trees which produced 11.3 per cent of blotch-free fruit.

The use of dilute sprays for applications after the bloom spraying was followed with excellent results.

Data are given on the susceptibility of several varieties to spray injury.

A biochemical study of the false-blossom disease of the cranberry, C. P. SPAETH and H. R. KRAYBILL (*New Hampshire Sta. [Sci. Contrib. 22]* (1927), pp. 13).—This publication has been noted previously (*E. S. R.*, 57, p. 54).

A root rot of Lucretia dewberry caused by a variety of Collybia dryophila Fr., R. F. POOLE (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 5, pp. 453-464, figs. 9).—From the North Carolina Experiment Station, the author gives a description of a root disease of the Lucretia dewberry, which is said to be causing severe damage throughout the sand hills from Sanford to Hamlet, N. C. The symptoms of the disease are a stunted growth of the plant resulting from a diseased root system; wilting, caused by a recent attack of the disease on canes below old spurs left after pruning, and by the death of the roots; girdling of canes; small and bushy purplish leaves, etc.

The disease is considered to be caused by a parasitic variety of *O. dryophila*, which is said to be widely distributed in Europe and America, but it is said that the parasitic variety which is described may not be widely distributed.

The disease is said to be disseminated by means of infected plants and on pruning shears. Plants known to be susceptible to the disease in addition to the Lucretia dewberry are the southern blackberry and the wild southern dewberry.

The control of mosaic of red raspberries from the nursery inspector's standpoint, A. G. RUGGLES and J. D. WINTER (*Jour. Econ. Ent.*, 19 (1926), No. 2, pp. 365-370).—As a result of a survey commenced in 1923 and completed in 1924, commercial plantings of red raspberry in Minnesota were found to contain a large amount of mosaic infection, and in the latter year an attempt to control the disease in the propagating stocks was begun. Very satisfactory results obtained by roguing indicate that this method is practicable provided a distance of 20 rods is secured between infected raspberries and the rogued planting. Plants of the variety Latham from 18 isolated plantings rogued in 1924 averaged only 1.3 per cent mosaic in 1925, while plants of the same variety from 14 nonisolated plantings rogued in 1924 averaged 9.0 per cent mosaic.

Lanarkshire strawberry disease: A report for the use of growers, C. W. WARDLAW ([Glasgow]: Botany Dept., Univ. Glasgow, 1926, pp. 39, pls. 4).—Prefaced by J. M. F. Drummond, and written mainly for the viewpoint of Lanarkshire strawberry interests, this account deals with different aspects of the so-called Lanarkshire strawberry disease and more particularly with the relations of soil and rooting conditions to this trouble. It was found that *Pythium debaryanum* and *Fusarium* sp. were always associated with the disease, but a *Rhizoctonia* occasionally present seemed to have no causal connection with the condition. A *Pythium* (*P. debaryanum*?) proved to be capable of attacking both young and old roots, causing dieback of the thick roots or denuding them of their fine rootlets. Other causes may operate. Relations of *Pythium* spp. and other fungi to diseases of some other plants are suggestively discussed.

"In the light of these observations it is clear that the cure of the Lanarkshire strawberry disease is very much more in the hands of the practical farmer and horticulturalist than in those of the mycologist. The main factor involved appears to be the general health of the plant. The fungal attack is to be regarded as an important accessory to the main factor. It is, however, a factor which has become increasingly aggressive owing to the accentuation of certain unfavorable soil conditions. If the roots reach a sufficient state of weakness and laxness they are liable to be attacked by any of the parasitic soil fungi. Thus the disease may be due to fungal agency in a general way, without necessarily being referable to one parasite in all cases."

Liming of soil for grapevine culture and court-noué [trans. title], E. DOUYSSSET (*Rev. Vitic.*, 64 (1926), No. 1647, pp. 41-43).—The value and the reliability of lime in agricultural practice and in connection with disease and abnormality is thought to be positive and permanent.

Court-noué [trans. title], G. CHAPAZ (*Rev. Vitic.*, 64 (1926), No. 1646, pp. 25-31).—A brief historical account, with description, is given of court-noué of grapevines.

Esca, P. VIALA (*Min. Agr. [France], Ann. Epiphyties*, 12 (1926), No. 1-2, pp. 108, pls. 4, figs. 80).—This memoir deals with the history (including bibliography), geography, and lesions of esca, apoplexy, or wilt of grapevines. cultures and botanical study of the causal organism, *Stereum necator* (which the author considers a true species), and treatments.

Treatments for esca [trans. title], P. VIALA (*Rev. Vitic.*, 64 (1926), No. 1655, pp. 201-208).—This is chapter 6 of the memoir noted above, and deals with practical treatments for esca.

A gunmosis of grapevines [trans. title], E. FOËX and A. AYOUTANTIS (*Rev. Vitic.*, 62 (1925), No. 1596, pp. 89, 90).—A reddish gelatinous mass, covering in spring several square decimeters of surface to a depth of 1 cm. on branches and shoots of grapevines is briefly described. This mass was composed of a fungus (*Fusarium* sp.), a green alga, and numerous bacteria. The effect on the plant was not determined.

The mildew outbreak of 1925: Resistance of some hybrids [trans. title], E. PÉE-LABY (*Rev. Vitic.*, 64 (1926), No. 1646, pp. 31-33).—The disease resistance and other qualities of some hybrid grapevines are outlined.

The composition and action of copper sprays [trans. title], MR. and MRS. G. VILLEDIEU (*Rev. Vitic.*, 64 (1926), No. 1648, pp. 67-70).—On the basis of experimentation carried on during 1924 and 1925, it is considered possible to reduce greatly the copper sulfate content of both sprays and dusts for fungicidal purposes.

Pomegranate blotch, F. A. WOLF (*Jour. Agr. Research* [U. S.], 35 (1927), No. 5, pp. 465-469, pl. 1, fig. 1).—A description is given of a disease of the foliage and fruits of the pomegranate (*Punica granatum*). The author states that this disease has hitherto been known as a leaf spot, but it also manifests itself by characteristic blotches on the fruit. It is known to occur in Texas, Florida, Alabama, and Bermuda. The disease is said to be caused by *Mycospharella tythracearum* n. sp., a technical description of which is given. The conidial stage of the fungus is reported to be *Cercospora lythracearum*, which is present throughout the entire year in Florida on green foliage. A spermatogonial stage is found during autumn on the lower surface of lesions caused by the *Cercospora* stage, and mature perithecia are said to be present in early spring on fallen leaves.

The cause of lemon dieback in Messina [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg.* [Rome], n. ser., 6 (1926), No. 2, pp. 108-118, figs. 2).—A wither tip or die-back of lemon in Messina has been studied, and the account herein given shows the probable causality of *Colletotrichum gloeosporioides*.

Internal decline of lemons, III, IV (*Amer. Jour. Bot.*, 13 (1926), Nos. 2, pp. 102-117, figs. 11; 6, pp. 342-354).—A continuation of studies previously noted (*E. S. R.*, 51, p. 758).

III. Water deficit in lemon fruits caused by excessive leaf evaporation, E. T. Bartholomew.—The author states that the lemon fruit proves to be well suited to the study of water deficit produced by excessive leaf evaporation, because of its size, water content, and semiflexibility of structure, and because the leaves lack the ability to regulate evaporation conservatively. It is thought that other species of citrus may prove adaptable to similar studies.

Auxographic records have shown that the lemon fruit is very sensitive to changes in water content of the leaves as affected by the soil moisture content and by climatic conditions.

"That the amount of water withdrawn from the lemon is dependent, to a certain extent, upon the amount of moisture in the soil is shown by the fact that the drier the soil becomes the greater the amount of water withdrawn from the lemon and the greater the length of its period of water deficit. While these tests have shown that the amount of water available for the fruits is influenced by the amount of available moisture in the soil, yet they have also forced the conclusion that, regardless of the moisture in the soil, the root system of a lemon tree when grown under arid or semiarid conditions is not

able fully to supply the water demands under conditions producing rapid evaporation. The records show that during periods of excessive evaporation there may be not only a daily water deficit but one which may last, during the night as well as during the day, for at least three or four weeks at a time. That such a deficit must have a profound effect upon the fruit would appear to be evident. It must materially affect the size, texture, amount, and nature of solids, flavor, keeping quality, etc., of the fruit."

IV. *The carbohydrates in the peel of healthy and endoxerotic fruits*, E. T. Bartholomew and W. J. Robbins.—The authors found that a large portion of carbohydrate material is present in the albedo of the lemon peel, from 50 to 62 per cent of the dry matter being composed of reducing material calculated as carbohydrates soluble in 95 per cent alcohol or hydrolyzable in 1 per cent hydrochloric acid. The polysaccharides hydrolyzed by 1 per cent hydrochloric acid are approximately constant, composing from 24.7 to 35 per cent of the tissue dry weight. Mono- and disaccharides vary more (13.5 to 34.4 per cent), and show no constantly higher percentage in endoxerotic or healthy tissues. The ratio of hexosans to the total carbohydrates was always less in the endoxerotic than in healthy lemons of the same lot; the ratio of pentosans to total carbohydrates was greater, and the ratio of pentosans to hexosans much greater in endoxerotic than in healthy lemons. Endoxerotic tissues contained from 39 to 63 per cent more pentosans than healthy tissues. It appears that the pentosans are formed at the expense of the hexosans.

The yeast fermentation method as commonly used is not considered to be generally reliable for the determination of pentoses.

Walnut rot [trans. title], M. GARD (*Rev. Vitic.*, 64 (1926), No. 1654, pp. 188-191).—Preventive measures for walnut rot should vary according to the age of the tree and the nature of the soil, but measures of somewhat general utility include avoidance of injuries, too deep planting, planting on recent clearings, planting among stumps (especially those of walnut), and planting in hard or poor soil.

Studies on aster yellows, L. O. KUNKEL (*Amer. Jour. Bot.*, 13 (1926), No. 10, pp. 646-705, pls. 5, figs. 4).—A characteristic chlorosis of China aster (*Callistephus chinensis*), known as yellows and said to be widely prevalent in the United States but not elsewhere in aster-growing regions, is considered to belong in the virus-disease group. Aster yellows was transmitted by budding, but not by other mechanical means. It is carried by the leafhopper *Cicadula 6-notata* to any of more than 50 plant species in 23 families, but evidently not by any of several other aster insects which were studied. It has likewise been carried back from many of the plant species to aster. It shows no attenuation during such transmission.

Both nymphs and adults are unable to transmit the virus immediately after feeding on yellowed plants, a period of at least 10 days being required before they become inoculative. This is referred to as the incubation period for this virus in the insect. It is somewhat shorter in adults than in nymphs. Many individuals retain the virus during life, but some lose it quickly. The virus is not transmitted through the eggs of the insect carrier or through seeds of the aster, nor is it transmitted from yellowed to healthy plants by contact or directly from a virus-bearing insect to virus-free insects. Individual insects have been found to carry the virus for more than 100 days. Small colonies of insects on rye plants immune to yellows have been shown to retain the virus for at least 2 months.

Aster yellows is said to be identical with white-heart disease of lettuce, with a previously undescribed disease of buckwheat, and with several yellows diseases

of cultivated garden plants. Though similar to peach yellows, strawberry yellows, beet curly top, and cranberry false blossom, it appears to be distinct from these diseases. It is not identical with the stunt disease of dahlia. The disease overwinters in biennial and perennial host plants, some of the most common of which belong in the genera *Chrysanthemum*, *Sonchus*, *Asclepias*, *Erigeron*, and *Plantago*.

Partial wilting of *Hibiscus tiliaceus*, H. CHAUDHURI (*Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), p. 220).—A wilting in early spring and summer of newly formed twigs of *H. tiliaceus* which has been observed in two plants in the Lahore Botanic Gardens during three years was found to be due to attack by a species of *Alternaria* which has caused much loss in *Jasminum* and marigold beds in Lahore by causing dry rots of the flower buds. No cross inoculation with *Jasminum* and marigold succeeded, though the disease can be transmitted from one plant to the other.

Young twigs wilted when placed in a filtrate in which the disease causing organism had grown for 12 days. The organism secretes considerable alkali, changing Coons' medium from pH 4.5 to 7.0 in 12 days. The wilting is said to be due to this alkaline secretion. The organisms penetrate the young growing regions but not the older tissues. The fresh young spores can not endure the summer temperature, and hence do not affect the later twigs. Infection is renewed only from the outside.

***Micrococcus ulmi* on maple and linden** [trans. title], A. BRUSSOFF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 36 (1926), No. 9-10, pp. 269-274).—Studies showed that a disease of *Acer dasycarpum*, *Tilia intermedia*, and *T. platyphyllos*, in connection with the presence of *M. ulmi*, was associated with a stoppage of the vessels, as in case of the so-called Holland elm disease.

The white pine blister rust situation, W. A. McCUBBIN (*Jour. Econ. Ent.*, 19 (1926), No. 2, pp. 350-356).—An outline is given of the history of blister rust in this country, of the essential factors in control measures, and of some features considered as unsettled.

Manual of wood rots for cruisers and scalers in the Inland Empire, E. E. HUBERT (*Timberman*, 28 (1927), Nos. 3, pp. 42-44, 46, figs. 4; 4, pp. 43, 44, 46, 48, figs. 6; 5, pp. 48-52, figs. 3; 6, pp. 48-50, 52, 53, figs. 3).—A systematic account, written for lumbermen, is given of various rots, causal organisms, symptoms, and effects.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Fur laws for the season 1927-28, F. G. ASHBROOK, F. L. EARNSHAW, and F. G. GRIMES (*U. S. Dept. Agr., Farmers' Bul.* 1552 (1927), pp. 11+28).—This is the thirteenth annual summary of the fur laws in the United States (*E. S. R.*, 56, p. 56).

Directory of officials and organizations concerned with the protection of birds and game, 1927, compiled by T. DENMEAD (*U. S. Dept. Agr., Misc. Pub.* 6 (1927), pp. 12).—This is the twenty-eighth annual directory (*E. S. R.*, 56, p. 56) prepared by the Bureau of Biological Survey.

The book of birds, edited by G. GROSVENOR (*Washington, D. C.: Natl. Geogr. Soc.*, 1925, pp. [5]+215, [figs. 296]).—This is a revised and enlarged edition of the work previously noted (*E. S. R.*, 39, p. 759).

The life history of tapeworms of the genus *Mesocestoides*, B. SCHWARTZ (*Science*, 66 (1927), No. 1696, pp. 17, 18).—In referring to the status of knowledge of the life history of tapeworms of the genus *Mesocestoides*, the author reports success in rearing one in dogs and cats through feeding *Dithyridium* obtained from the peritoneal cavity and lungs of a mongoose. He concludes

that a susceptible host becomes infested with a strobilate tapeworm of the genus *Mesocostoides* as a result of devouring a carcass or a portion of a carcass of an animal harboring *Dithyridium*, and that the latter is not a tapeworm which has accidentally strayed from its course but is a true larva in a normal location in an intermediate host.

A subcutaneous tumor in a primate caused by tapeworm larvae experimentally reared to maturity in dogs, B. SCHWARTZ (*Jour. Agr. Research* [U. S.], 35 (1927), No. 5, pp. 471-480, pls. 2, figs. 8).—In this paper the author describes a large subcutaneous cyst from a baboon, caused by larval cestodes of the genus *Multiceps*, and closely related to, if not identical with, *M. serialis*.

As a result of feeding one or more bladder worms (coenuri) to each of four dogs, the adult tapeworm was experimentally reared in these animals. Its morphological organization was found to be similar to, if not identical with, that of *M. serialis*. Owing, however, to a failure to develop the larval stage of the tapeworm in rabbits as a result of feeding them gravid proglottids of the tapeworms experimentally reared in dogs, the specific identity of the worm is deemed open to question, and in order to avoid confusion it is given varietal rank, the name *M. serialis theropithecii* being proposed for it. It is suggested that *M. serialis theropithecii* probably represents a physiological species that has become adapted to a new intermediate host. The possibility that such host adaptations may ultimately lead to species differentiation among parasites appears to be indicated as a possibility.

A method for obtaining infective nematode larvae from cultures, G. F. WHITE (*Science*, 66 (1927), No. 1709, pp. 302, 303, fig. 1).—The author gives an outline of a method that has been employed for a year and a half and has proved to be entirely adequate in trapping the migrating larvae as they approach the third larval stage and the close of the free-living period.

Researches on the teratology of insects, P. CAPPE DE BAILLON (*Recherches sur la Tératologie des Insectes*. Paris: Paul Lechevalier, 1927, pp. 291, pls. 9, figs. [77]).—Chapter 1 of this work deals with embryology (pp. 15-61), chapter 2 with morphology (pp. 62-150), chapter 3 with biology (pp. 151-189), and chapter 4 is a critical review of the bibliography (pp. 190-270). A 17-page bibliography is included.

Some non-nervous factors that condition the sensitivity of insects to moisture, temperature, light, and odors, C. H. KENNEDY (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, pp. 87-106).—In this review the author attempts to show that, while the final sensitivity is a function of the nervous system, it is conditioned by various other structural features of the organism in question. The small size of the insect has conditioned the sensitivity to moisture and temperature. The chitinous exoskeleton has conditioned sensitivity to odors and to light and also the quality of the sense of touch.

The penetration of a contact oil spray into the breathing system of an insect, F. C. NELSON (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 632-635; also in *Crop Protect. Digest*, No. 12 (1926) [issued 1927], pp. 632-635).—This work was carried out in cooperation with the New Jersey Experiment Stations. The studies indicate that with a spray of kerosene or the insecticide Flit a greater penetration of the liquid into the tracheal tubes takes place than is usually supposed. The surface tension of the spray is considered directly responsible for this penetration, and might easily increase or decrease the efficiency of the spray by causing a greater or lesser penetration and thus reduce the concentration of the toxic principle in near proximity to the nervous system.

Chemical studies of the sulfur-lime dry mix spray in regard to the formation of water soluble arsenic, J. M. GINSBURG (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 625-631).—Experiments at the New Jersey Experiment Stations indicate that sulfur alone in the absence of both Kayso and calcium hydroxide does not appreciably influence the decomposition of acid lead arsenate. When Kayso is added to $PbHAsO_4$ in the absence of $Ca(OH)_2$, large quantities of soluble As_2O_3 are formed. This is apparently brought about by the lime of the Kayso which becomes partially carbonated upon standing. This phenomenon was not observed when either casein or skim milk was substituted for Kayso. Calcium carbonate in solution reacts directly with the lead arsenate, forming soluble arsenic salts. The presence of an excess of hydrated lime greatly retards the formation of soluble arsenic, but does not entirely eliminate it. The smallest quantity of soluble arsenic was found when 6 or 8 lbs. of hydrated lime were used in 50 gal. of spray. Sulfur lime dry mix spray could be made more stable chemically by substituting powdered skim milk for Kayso.

A study of lead arsenate and lime spray mixtures, P. A. VAN DER MEULEN and E. R. VAN LEEUWEN (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 4, pp. 313-321).—A report is given of a study of the action of a solution of calcium hydroxide on acid lead arsenate. Under the conditions of the experiments, long continued action of an excess of calcium hydroxide on acid lead arsenate resulted in decomposition of the lead arsenate, with a formation of basic calcium arsenate and a hydrate of lead oxide. The reaction is said to take place slowly, and under the conditions usually met with in spraying operations probably less than 1 per cent of the acid lead arsenate is decomposed. It is claimed that the action of the carbon dioxide of the air on the mixture of calcium hydroxide and lead arsenate does not produce an appreciable increase in soluble arsenic until after all the lime has been carbonated, after which the amount of soluble arsenic may increase very materially.

Orchard experiments with lead arsenate, with and without the addition of slaked lime, were conducted during the seasons of 1923 to 1926, inclusive, at Riverton, N. J., and it was definitely shown that slaked lime added to lead arsenate prevented peach foliage injury by soluble arsenic. In one series of experiments, in which a lime high in magnesia was used, no injury resulted. There is said to be a practical advantage in combining 3 lbs. of slaked lime with 1.5 lbs. of acid lead arsenate in 50 gal. of water.

A study of arsenical residues on apples in Pennsylvania with respect to efficient spraying practices, G. F. MACLEOD, D. E. HALEY, and R. H. SUNDS (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 607-614, fig. 1).—This is a contribution from the Pennsylvania Experiment Station. Insect species attacking apples in Pennsylvania necessitated six arsenical spray applications, the omission of one or more resulting in increased injuries to the fruits. Satisfactory protection was obtained during 1926 without excessive arsenic occurring on the apples at harvest time. The sprays were applied with but little, if any, deviation from the usual procedure, and no supplementary preparation of the fruit was necessary.

Reducing the cost of nicotine sulphate sprays, H. N. WORTHLEY (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 615-625, figs. 4).—In this contribution from the Massachusetts Experiment Station the efficiency of some common chemicals as liberators is recorded, and data are presented suggesting that their use in nicotine sulfate sprays will allow a reduction in the dosage of nicotine.

Bordeaux mixture and lime sulfur are good liberators of nicotine, but the efficiency of nicotine in such sprays is increased by the addition of sal soda. With forms easily controlled this may allow a reduction in dosage, and it may

also aid in reducing such stubborn pests as the rosy apple aphid in curled leaves and the apple red bugs. Potash fish-oil soap seems to be the most satisfactory liberator of nicotine when used alone, particularly against resistant forms, such as insect eggs. For every pint of nicotine sulfate, 12 oz. of sal soda or a quart of fish-oil soap added to the spray mixture will act effectively to increase the efficiency of the nicotine. Potash fish-oil soap gives relatively slow, long continued evolution of nicotine, while sal soda throws it out into the air with great rapidity. As shown in the tests against squash vine borer eggs, this extremely swift evolution of nicotine is not always desirable.

Ethylene dichloride-carbon tetrachloride mixture, a new non-burnable, non-explosive fumigant, R. T. COTTON and R. C. ROARK (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 636-639).—The authors find a new fumigant consisting of 3 parts by volume of ethylene dichloride and 1 part by volume of carbon tetrachloride to be very effective against stored product pests, being five times as toxic as carbon tetrachloride. It is cheap, noninflammable, non-explosive, and noninjurious to stored commodities, and is not dangerous to human life.

An apparatus for the rapid vaporization of carbon disulphide, C. A. WEIGEL, H. D. YOUNG, and R. L. SWENSON (*U. S. Dept. Agr. Circ.* 7 (1927), pp. 8, figs. 4).—This is a report of work conducted with a view to developing a practical and simple method by which growers can treat infested narcissus bulbs for the control of the bulb fly and lesser bulb fly under field or storage conditions as a substitute for the vacuum method.

The work led to the construction of the apparatus here described and illustrated for use in hastening the vaporization of the carbon disulfide. The apparatus developed consists of a copper coil placed in the bottom of a shallow copper pan with flaring sides. The bottom is made in the form of a flattened cone, so that the carbon disulfide may drain to a low point. The inlet of the coil is connected directly to the hot water supply system and provided with a valve to control the flow of water, which enters the outside coil, so that the hottest water is available for the last portions of the carbon disulfide. The outlet has a short hose attached so that the water used can be collected and measured. The inlet and outlet of the coil used in these experiments were each provided with a thermometer so that the temperature at these points could be read. The results obtained in vaporization with $\frac{3}{8}$ - and $\frac{1}{2}$ -in. coils at a water temperature of 84.4° C. (184° F.) or under are given in tabular form.

Importance of patent literature to economic entomologists, R. C. ROARK (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 640, 641).—It is pointed out that patent literature often describes valuable new insecticides, gives the composition of some proprietary preparations sold under extravagant insecticidal claims, and describes new apparatus and processes for the application of insecticides and for the destruction of insects by physical means.

The parasite element of natural control of injurious insects and its control by man, L. O. HOWARD (*Smithson. Inst. Ann. Rpt.* 1926, pp. 411-420).—This is a general discussion of the subject.

The control of insect pests by means of parasites, S. A. NEAVE (*Nature [London]*, 120 (1927), No. 3016, pp. 267, 268).—A brief discussion of the subject.

The entomological problems of Queensland cotton growing, E. BALLARD (*Empire Cotton Growing Rev.*, 4 (1927), No. 3, pp. 196-205, fig. 1).—A brief account of the occurrence of insect pests of cotton following the marked increase in cotton production that commenced in 1922.

The relation of insects and weather to the development of heart rot of celery, J. G. LEACH (*Phytopathology*, 17 (1927), No. 9, pp. 663-667, figs. 2).—

The author's experiments here reported show that *Scaptomyza graminum* and *Elaeophora costata* are common agents of inoculation of celery heart rot. In addition, they are in all probability the chief agents of dissemination, as the adult flies commonly feed on the decaying tissues and have every opportunity to carry viable bacteria from diseased plants to the healthy leaves on which they deposit their eggs.

The citrus insects of Japan, C. P. CLAUSEN (*U. S. Dept. Agr., Tech. Bul. 15* (1927), pp. 16, figs. 5).—This is a summary of information on citrus insects based upon a review of the literature and observations made by the author in Japan while engaged in investigations of the Japanese beetle and its parasites and other enemies. It is pointed out that the climate of Japan corresponds to that of Florida rather than that of California, and that none of the more serious citrus pests of Japan are found as such in California, whereas a list of the relatively unimportant pests of Japan includes practically all of the injurious citrus insects of California and Florida. The most serious scale insects are the yanone scale, the red wax scale, the orange Pulvinaria, the chaff scale, the aspidistra scale, and Glover's scale. The small size and the location of the groves is said to render the use of large spraying and fumigating units economically or physically impracticable. The survey shows that there are citrus pests in the East which have not as yet been introduced into the United States, and which might prove to be dangerous species here.

Diseases common to man and animals, D. S. RABAGLIATI (*Highland and Agr. Soc. Scot. Trans., 5. ser., 39* (1927), pp. 97-130).—A somewhat extended discussion of this subject.

A reference list of the trematode parasites of man and the Primates, W. NICOLL (*Parasitology, 19* (1927), No. 3, pp. 338-351).—In this paper the author includes a list of the trematode parasites of man and the Primates, arranged systematically, and a second list arranged according to their hosts. A four-page list of references is included.

Seventeenth annual report of the State entomologist of Colorado, C. P. GILLETTE, G. M. LIST, ET AL. (*Colo. State Ent. Circ. 51* (1926), pp. 82, figs. 12).—The introduction to this report (*E. S. R.*, 55, p. 455) includes a list of greenhouses and nurseries inspected, etc. Brief notes on insect pests of the year (pp. 11-14) are followed by brief reports on cutworms, by W. P. Yetter, jr.; alfalfa weevil in Colorado, by J. H. Newton; grasshopper control, by G. S. Langford; strawberry root weevil (*Brachyrhinus rugifrons* Gyll.) (pp. 16, 17) and control of fruit tree leaf roller (p. 17), both by J. H. Newton; and the army cutworm in 1925, by G. S. Langford (pp. 18-22); Mexican Bean Beetle Control on the Western Slope (pp. 22-25) and Codling Moth Work in Delta and Montrose Counties (pp. 25, 26), both by J. H. Newton; Codling Moth Work in Mesa County, by W. P. Yetter, jr. (pp. 26-35); Tests of Lime Caseinate Spreader in Codling Moth Control, by J. H. Newton (pp. 35-41); Report on the Experimental Work Conducted on Grasshopper Control for the Year 1925, by G. S. Langford and K. D. Arbuthnot (pp. 41-50); The Life History of the Willow Scale (*Chionaspis salicis nigrae* Walsh), by G. S. Langford (pp. 50-58); Apiary Inspection and Investigation, by R. G. Richmond (pp. 59-61); Notes on Rodent Pests, by W. L. Burnett (pp. 62-68); The Effect of Sodium Arsenite upon the Growth and Production of Certain Crop Plants, by J. H. Newton (pp. 69-79); and Report of the Barberry Eradication Campaign in Colorado, by E. A. Lungren (pp. 79-82).

Insects of Indiana for 1926, J. J. DAVIS (*Ind. Acad. Sci. Proc., 42* (1926), pp. 293-308, figs. 10).—This is a summary of the important insect problems of

the year 1926, in continuation of that of the preceding year (E. S. R., 56, p. 755).

Insect pests in Texas, J. W. SHERWOOD (*Mil. Surg.*, 60 (1927), No. 5, pp. 581-587).—This is a brief account of insects affecting man and animals.

Insect and other animal enemies of 1926, R. S. MACDOUGALL (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 39 (1927), pp. 131-165, figs. 16).—This is an annual summary of the more important insects of the year in Scotland (E. S. R., 56, p. 659).

Report of the entomological division [of Ceylon], J. C. HUTSON (*Ceylon Admin. Rpts., Sect. IV, Dept. Agr., 1926*, pp. D20-D22).—The occurrence of insects of importance during the year and control work conducted are reported.

[Report of work in] entomology, D. MILNE (*Punjab Dept. Agr. Rpt. 1926*, pt. 1, pp. 49-54).—This is an account of observations and control work with economic insects of the year in the Punjab.

The life-history and control of some Malayan insects of economic importance, G. H. CORBETT and C. DOVER (*Malayan Agr. Jour.*, 15 (1927), No. 7, pp. 239-270, pls. 5).—The several parts of this contribution deal with *Orgyia turbata* Butler, a possible pest of rubber (pp. 240-255); the tortoise beetle (*Aspidomorpha miliaris* Fab.) (pp. 256-262), a pest of sweet potato; and the copra bug, officially known as the red-legged ham beetle (pp. 263-268), infesting copra godowns from which it spreads to private houses in the vicinity and constitutes a nuisance. In the appendix (pp. 268, 269), B. J. Eaton reports briefly upon the presence of hydrocyanic acid in copra after fumigation with the gas. The results of his investigation indicate that upon exposing copra to the sun and air the prussic acid is eliminated.

Tea termites in Ceylon, F. P. JEPSON (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, 1926, No. 3, pp. 134-142).—A preliminary report of studies of the tea termites of Ceylon.

Thysanura, Dermaptera, and Orthoptera of France and the European fauna, I, II, C. HOULBERT (*Trysanoures, Dermaptères et Orthoptères de France et de la Faune Européenne. Paris: Octave Doin, 1924, vol. 1, pp. XII+382, pls. 9, figs. 87; 1927, vol. 2, pp. [8]+357, pls. 15, figs. 46*).—Following a glossary, part 1 deals with the Thysanura (pp. 19-210), part 2 with the Dermaptera (pp. 211-262), and part 3 with the Orthoptera (pp. 263-381+357), of France and the European fauna. A 9-page bibliography of the Thysanura, a 4-page bibliography of the Dermaptera, and a 16-page bibliography of the Orthoptera are included.

Food preferences of the black cricket (*Gryllus assimilis*) with special reference to the damage done to fabrics (Orthop.), M. B. SAVIN (*Ent. News*, 38 (1927), Nos. 1, pp. 4-10; 2, pp. 33-39).—In the author's feeding experiments there was nothing in the list of varied carbohydrate, protein, fat, and mineral matter that was not eaten in part or entirely by one if not all of the individuals used.

Calcium cyanide for the control of the squash bug, *Anasa tristis* De Geer, V. A. LITTLE (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 575-577).—In experiments conducted upon squashes at the Texas Experiment Station during the summer of 1926, over 80 per cent control of the squash bug was obtained with the undiluted Cyanogas calcium cyanide "A" dust.

Leaf-hoppers injurious to apple trees in the Hudson Valley, F. H. LATHROP (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 577-581, figs. 2).—The author reports upon observations of *Typhlocyba pomaria* McAtee, which caused serious injury to apple trees in the Hudson Valley during the seasons of 1923 and 1924. The injury was in the nature of a white stippling of the foliage, resulting in

serious loss of chlorophyll in severe cases. More or less discoloration of the fruit resulted from the honeydew discharged by the insects. Severe infestation was observed on McIntosh, Baldwin, and Greening apple trees, ranging from McIntosh of early bearing age to mature Baldwins.

The winter eggs of *T. pomaria* are found in apple bark, mostly on second year wood. In 1924 hatching began on May 19, two weeks later than the hatching of the first eggs of *T. rosae*. The first adults appeared during the third week in June. The first eggs of the second generation were observed on July 23. Hatching began during the second week in August, and adults appeared in mid-September. The winter eggs are deposited during late fall.

The most effective control of *T. pomaria* was secured by an application of nicotine sulfate ($\frac{1}{4}$ pint to 100 gal. of water), applied after all of the winter eggs had hatched but before any adults appeared. Two per cent nicotine-lime dust was effective during mid-July, when the adult hoppers predominated. Oil sprays, applied at the delayed dormant period, proved ineffective in destroying the winter eggs.

Notes on collections of the sugar beet leaf-hopper showing the extension of its known range into British Columbia and to the coast in Washington and Oregon, E. W. DAVIS (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 581-586, fig. 1).—In this contribution from the U. S. D. A. Bureau of Entomology the results of a survey extend the known range of the beet leafhopper to the coast in Washington and Oregon and into British Columbia, 140 miles north of the international boundary. Observations on the stage of the insect, host plant, date, and locality are recorded and mapped.

Curly-top of sugar beets in South Dakota, H. H. P. and H. C. SEVERIN (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 586-588).—In this contribution from the California Experiment Station and the South Dakota State College, jointly, it is reported that curly top of sugar beets was found to occur, on rare occasions, in the beet fields of the western part of South Dakota. Sweepings with an insect net from the most favorable host plants of the beet leafhopper failed to include a single beet leafhopper. It was demonstrated, however, that non-infective beet leafhoppers transmitted curly top from South Dakota diseased beets to healthy beet seedlings under greenhouse conditions in California.

Studies on chemical changes during the life cycle of the tent caterpillar (*Malacosoma americana* Fab.).—III, Soluble ash and sulfates, W. RUDOLFS (*Jour. N. Y. Ent. Soc.*, 35 (1927), No. 3, pp. 219-229, figs. 6).—This contribution, the third of a series from the New Jersey Experiment Stations (E. S. R., 56, p. 757), deals with soluble ash and sulfates. The data obtained by chemical analyses on the accumulation and fluctuation of sulfates and carbonates, which are considered a part of the end products of the life processes of the apple tent caterpillar, are presented graphically and discussed. The relation between sulfates and carbonates during the different stages of development and the fluctuations occurring are compared with the moisture, fat, and nitrogen content of the insect. Nitrogen appears to play an important rôle at three critical stages, namely (1) when the larvae are formed, (2) when the insect gets ready for pupation, and (3) when the pupae change to the adult stages. Fatty substances are used and stored for energy, and do not appear to be of special importance at any critical stage for tissue building. It appears that the moisture content of the insects during the different stages of development is directly related to the rate of their activities.

Insecticidal control for sugarcane borer, W. E. HINDS and H. SPENCER (*Louisiana Stas. Bul.* 201 (1927), pp. 56, figs. 4).—This is a progress report of control work with the sugar cane borer, earlier accounts of which have

been noted (E. S. R., 57, pp. 261, 554, 857). A review of insecticidal tests in 1925 is followed by an account of dusting tests in 1926, the details of which are given in tabular form.

Many tests have shown the possibility of destroying two-thirds or more of the borer larvae in corn or in cane, and that the addition of 10 per cent by weight of hydrated lime to sodium silicofluoride dusts decreases the tendency to burn the foliage of both crops. The addition of larger proportions of hydrated lime does not entirely remove the possibility of burning but does decrease materially the control of borers. While sodium silicofluoride has been the most promising dust for extensive use thus far, the silicofluorides of aluminum, barium, and magnesium deserve further study. The effectiveness of silicofluoride dusts appears to depend upon their water-soluble elements principally. They act both as a stomach and a contact poison to the borers. The larvae may succumb within an hour from contact with the dust or from being wet in its solution. The application of this insecticide does not appear to destroy the *Trichogramma* egg parasites either within the borer eggs before they emerge or in their attack on freshly laid borer eggs in dusted fields.

Extensive airplane dusting tests conducted in 1926 indicated that an application of from 15 to preferably about 20 lbs. of silicofluoride dust per acre is advisable to secure satisfactory control results. This dusting, with the best materials found in the Louisiana Station work for 1926 and at a rate of not more than 20 lbs. per acre on dry cane, may be considered absolutely safe so far as any danger of burning the eyes is concerned in even the most tender varieties of cane.

Through an examination of 1,166 stalks of undusted cane of four native varieties, it was found that 26.2 per cent of the joints showed borer burrows in the late fall of 1926, and in comparison with this where one dust had been applied from 6 to 8 weeks previously, there was found but 12.1 per cent of joints bored. In the dusted cane only about one-half as many living borer stages occurred as were found in the undusted cane. With the best dust materials used in 1926, and under favorable atmospheric conditions, a dust swath width of approximately 100 ft. could be covered with an effective cloud. With a dust rate of 20 lbs. per acre and on concentrated acreage at a distance of less than 5 miles from the landing field, at least 200 acres per hour may be treated.

The stalk borer: Life history in New Hampshire, 1925-1926, P. R. LOWRY (*New Hampshire Sta. Tech. Bul. 34* (1927), pp. 23, fig. 1).—This is a report of life history studies of the stalk borer, an insect common in New Hampshire, commenced in July, 1924. Though not a pest of major importance in the State, it is the cause of considerable injury to plants in vegetable and flower gardens. Occasionally it becomes abundant and causes serious damage to cultivated crops. Much of the data relating to its life history is presented in tabular form, and the record for two years is presented graphically and in chart form. The newly hatched larvae prefer certain grasses for food but later migrate to other plants, having been found infesting 28 different ones in New Hampshire. There is a single generation of the species each year. The winter is passed in the egg stage, the larvae hatching from the last half of May to the first part of June. Pupation occurs in August and the first part of September, the pupal period lasting 25 to 38 days. Adults emerge in September and the first few days of October and deposit eggs principally on dead grass. Natural and artificial control are briefly considered.

The European corn borer: Its present status and methods of control, D. J. CAFFEY and L. H. WORTHLEY (*U. S. Dept. Agr., Farmers' Bul. 1548*

(1927), pp. 11+48, figs. 42).—This supersedes Farmers' Bulletin 1204, previously noted (E. S. R., 48, p. 554).

The effect of submergence during the hibernating period on pupal formation and adult emergence in the European corn borer, M. F. CROWELL (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 564-567).—The author found in a single experiment conducted that 78 per cent of larvae submerged for 11 days died before pupation. Pupation and adult emergence in larvae that survived such a period of submergence was apparently normal.

On two new protozoan parasites of *Pyrausta nubilalis* Hbn. caterpillars [trans. title], A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1927), No. 14, pp. 673-675, figs. 2).—The author reports upon two protozoan diseases of the European corn borer met with in France. The first, epidemics of which frequently occur in certain regions of the East and have been observed by the author in two regions of the Jura, namely, Bletterans and Chaussin, is due to a microsporidian which he describes as new under the name *Perezia pyrausta*. This parasite occurs principally in the Malpighian tubes, which are hypertrophied, and in the silk glands. The second disease, a flagellosis characterized by the abundance of parasites in the Malpighian tubes, which appear greatly hypertrophied, and in the intestinal tract, is also due to a new species, for which the name *Leptomonas pyraustae* is proposed.

Summary of three years' tests of trap baits for capturing the codling moth, M. A. YOTHERS (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 567-575, fig. 1).—In work conducted by the U. S. D. A. Bureau of Entomology at Yakima, Wash., in badly infested apple orchards, it was found that thousands of codling moths could be captured in properly baited traps during the moth season. Cooked, fermented apple juice, containing some of the apple pulp, proved more attractive in capturing the moths than vinegar or cider. In 1926 a molasses ferment proved much more effective than apple ferment, honey ferment, or any of some two dozen essential oils. Of the essential oils only three, namely, oil of cloves, oil of citronella, and oil of sassafras, proved attractive to the codling moth. An enameled kettle about 8 in. in diameter and 3 in. deep was found to be the most promising type of bait container. Several times as many moths were captured in baits in the tops of trees as in baits at the height of the crotches. From 55 to 60 per cent of the moths captured were females, of which about 95 per cent were gravid, having laid none or very few of their eggs before capture. It is pointed out that trap baits show the beginning and end of the codling moth season, the beginning and end of each brood, and the maximum abundance for each, and that this information may be used to advantage in arranging spray dates for moth control. Codling moths are not attracted to baits during cool weather, most of them being captured while the temperature is 70° F. or above.

Notes on the life history of the bud moth, *Spilonota ocellana* D. & S., S. W. FROST (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 4, pp. 347-359, pls. 2, figs. 2).—In this contribution from the Pennsylvania Experiment Station studies of the life history with special reference to conditions in the southern part of the State, commenced in 1917 and extending over a period of five years, are reported upon. Other phases of the subject, including synonymy, food plants, distribution, and bibliography are omitted, having been discussed in the bulletin by Porter previously noted (E. S. R., 52, p. 254).

The author finds that larvae of the eighth, ninth, and tenth instars hibernate in small hibernacula on twigs near the buds. These emerge early the following spring, and after molting two or three times become mature toward the end of May and pupate within curled leaves. The pupa stage varies from 9

to 10 days. Adults live for an average of 14 days after emergence. There is a preoviposition period of 3 or 4 days. Eggs are laid singly or in small batches of from 2 to 20. They are glued to the leaf with a cement-like substance. The larvae appear about mid-June and feed on fruit and foliage until fall, when they hibernate. Most of their feeding is done on the under side of the leaves. There is high mortality among larvae in breeding cages, particularly during the earlier instars. Normally there is one generation of moths a year. The injury to mature fruit is said to be the most serious injury in the southern part of the State.

The pine tip moth in the Nebraska National Forest, S. A. GRAHAM and L. G. BAUMHOFER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 4, pp. 323-333, figs. 3).—This is a report of studies of *Rhyacionia frustrana bushnelli*, conducted by the U. S. D. A. Bureau of Entomology and reported under the headings of character of injury and susceptibility of species, seasonal history and habits, and parasites of the pine tip moth now present in the plantations. A recent report of studies of this pest by Swenk has been noted (E. S. R., 57, p. 453), as have studies of its parasites by Gahan (E. S. R., 57, p. 365) and by Cushman (E. S. R., 57, pp. 457, 560).

Studies of the enemies of plants and animals in Mexico [trans. title], A. DAMPF (*Mex. Sec. Agr. y Fomento, Ofic. Defensa Agr.* [Pub.] 1 (1927), pp. 26, pls. 19).—This first contribution deals with the morphology of the larvae of *Hypopta agavis* Blazquez (*chilodora* Dyar), a cossid enemy of maguey (*Agave* sp.) in the central mesa of Mexico.

Preliminary experiments for the control of certain European vine-moths by fumigating with Cyanogas calcium cyanide, S. M. DOHANIAN (*Psyche*, 34 (1927), No. 3-4, pp. 146-156).—The author reports upon experimental work with Cyanogas calcium cyanide for the control of European vine moths in vineyards near Bordeaux, France, and Lausanne, Switzerland.

It was found that treatments of *Cochylis* and *Eudemis* with dosages between 2 and 3.5 per cent by volume during exposures of from 1 to 2.5 hours give better kills than stronger dosages over shorter exposures or weaker dosages over longer periods of fumigation. Temperatures above 60° F. appeared to be more effective. High relative humidity did not appear to be so important a factor as high temperature.

A metal covering over the vines gave much better results in the number of insects killed than a canvas covering under identical conditions, apparently because it is more nearly air-tight and results in a higher temperature after a certain exposure than under a canvas tent and like exposure. In the winter dormant condition vines are not injured by the use of Cyanogas calcium cyanide. Both young and old vines seem to withstand with safety such strong treatments as 10 per cent volume for 45 minutes.

The army worms, S. E. CRUMB (*Bul. Brooklyn Ent. Soc.*, 22 (1927), No. 1, pp. 41-53, pls. 2).—In this contribution the author gives a key to the species of larvae having the army worm habit. This is followed by descriptions of 15 forms.

Four British aphid-eating gall-midges, H. F. BARNES (*Entomologist*, 60 (1927), No. 771, pp. 174-180, fig. 1).—The author records the rearing of four species of gall midges of the genus *Phaenobremia* from larvae feeding on as many species of aphids in Great Britain, including *Macrosiphum rosae glauca* Buckton, *Anuraphis roseus* Baker, *Phorodon humuli* Schrank, and *A. heliohrysti* Kalténbach. Three of the species are described as new.

Mosquito work throughout the world, L. O. HOWARD (*Amer. Jour. Pub. Health*, 16 (1926), No. 12, pp. 1210-1214).—A paper read before the public health

engineering section at the fifty-fifth annual meeting of the American Public Health Association at Buffalo, N. Y., October 14, 1926.

The stabling of cattle as a factor in the reduction of malaria in certain sections of Abkhassia, Georgia [trans. title], N. ROUKHADZE (*Bul. Soc. Path. Exot.*, 20 (1927), No. 2, pp. 153-170).—The author first reviews earlier studies of the subject of zoophily in *Anopheles* in connection with a list of 14 references. Studies are reported which have led to the conclusion that the intensity of malarial cases in certain villages of Georgia found infested is inversely proportional to the number of cattle kept stabled. This is in agreement with the findings of Roubaud (*E. S. R.*, 45, p. 555).

The fate of *Leptospira icteroides* and *Leptospira icterohaemorrhagiae* in the mosquito, *Aedes aegypti*, D. M. GAY and A. W. SELLARDS (*Ann Trop. Med. and Parasitol.*, 21 (1927), No. 3, pp. 321-342, fig. 1).—The authors' experiments with *L. icteroides* and *L. icterohaemorrhagiae* in the mosquito furnish additional evidence that they are identical.

The comparative value of Paris green and paraffin liquid as larvicides [trans. title], H. DE ROOK and N. H. SWELLENGREBEL (*Bul. Soc. Path. Exot.*, 20 (1927), Nos. 2, pp. 123-127, fig. 1).—The author prefers the use of paraffin liquid for mosquito control in the Netherlands except on the grand canals.

The mosquito fish (*Gambusia*) and its relation to malaria, D. S. JORDAN (*Smithson. Inst. Ann. Rpt. 1926*, pp. 361-368, pls. 4).—This is a discussion of the importance of *Gambusia* spp., particularly *G. patruelis*, in mosquito control. The account refers to its collection in Texas and introduction into the Hawaiian Islands and the Orient and into numerous countries of Europe. Recent experimental work with this fish conducted in Georgia by Hildebrand has been noted (*E. S. R.*, 54, p. 459).

The parasite of Oriental sore in the phlebotome: Natural and experimental infection of *Phlebotomus papatasi* (Scop.) [trans. title], L. PARROT and A. DONATIEN (*Arch. Inst. Pasteur Algérie*, 5 (1927), No. 1, pp. 9-21, pls. 4, fig. 1).—In studies conducted at Biskra the authors recovered the parasite of Oriental sore in the flagellate form from *P. papatasi*, the transmitting agent of this dermatosis. They succeeded in transmitting the infection experimentally to this host by its feeding on a mouse inoculated with *Leishmania* by a new technique.

Zoological contributions to the surra problem.—XV, Some transmission experiments with *Chrysops flaviventris* Macq. and *C. dispar* Fab. [trans. title], O. NIESCHULZ and S. A. S. PONTO (*Nederland. Indische Bl. Diergeneesk.*, 39 (1927), No. 4, pp. 308-321, fig. 1; *Ger. abs.*, pp. 320, 321).—Surra transmission experiments with two of the four species of *Chrysops* occurring in Sumatra and Java have shown that both *C. flaviventris* and *C. dispar* may transmit this trypanosome, although not to the extent that species of *Tabanus* do.

A year's test of a so-called "fly-salt," L. C. AICHER, R. H. LUSH, and R. C. SMITH (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 593-602, pl. 1).—This is a contribution from the Kansas Experiment Station, in which it is concluded that a fly salt containing 9.77 per cent of free sulfur and sold extensively throughout the Middle West is without value for the purpose recommended, namely, prevention of flies from biting cattle through excretion of sulfur in the perspiration. Animals fed all the salt they would eat were attacked by flies to the same extent as those fed common salt, and approximately the same percentage of flies caught on the animals contained blood which was unquestionably derived from the cattle.

The dipterous parasites of the migratory locust of tropical America, *Schistocerca paranensis* Burmeister, J. M. ALDRICH (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 588-593).—These notes relate to *Oedematocera dampfi* Ald.,

Sarcophaga caridei Brethes, *S. sternodontis* Towns., and *Brachycoma acridorum* Weyenb.

Dipterological notes, C. W. JOHNSON (*Psyche*, 34 (1927), No. 1, pp. 33-35).—The author records the infestation of bluebird nests by numerous larvae and pupae of *Protocalliphora splendida* Stål S. & D. at Rock and Needham, Mass.; the infestation of a great horned owl at Wenham, Mass., by *Ornithopomus americanus* (Leach) and *Ornithoica confluenta* (Say); and the collection of *Muscina pascuorum* Meig. at Salisbury Cove, Mount Desert, Me., and Nantucket Island, Mass. A brief account is given of the narcissus fly, which was reared at Boston in 1868, having apparently been introduced in bulbs from the Netherlands.

The Mediterranean fruit fly, J. M. BERRO AGUILERA (*El Gusano de las Frutas Ceraatidis capitata* Wied. Almería, Spain: *Estac. Patol. Veg. Almería*, 1927, pp. 89, figs. 15).—A general summary of information on this pest in the Province of Almería.

An unusual form of parasitism of an anthomyid fly, K. M. SMITH (*Parasitology*, 19 (1927), No. 2, pp. 260-262, pl. 1, fig. 1).—This is a brief report of observations of an attack of the cabbage maggot, *Hydomyia brassicae* (Bouché), by a fungus somewhat resembling species of *Empusa*.

Further information on a contact spray for the control of the Japanese beetle (*Popillia japonica* Newm.), E. R. VAN LEEUWEN and P. A. VAN DER MEULEN (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 603-607).—This contribution from the U. S. D. A. Bureau of Entomology records the improvement made in the sodium oleate-oleoresin of pyrethrum spray for the control of the Japanese beetle by the addition of sodium silicate. The addition of 6 fluid oz. of sodium silicate solution to a mixture composed of 86.5 oz. of sodium oleate, 9.5 oz. of oleoresin of pyrethrum flowers, and 100 gal. of water resulted in a very striking increase in toxicity.

Preliminary notes on the depth of hibernation of wireworms (Elateridae, Coleoptera), J. W. MCCOLLOCH, W. P. HAYES, and H. R. BRYSON (*Jour. Econ. Ent.*, 20 (1927), No. 4, pp. 561-564).—In preliminary studies conducted at the Kansas Experiment Station, consisting of a series of diggings largely in uncultivated areas where wireworms are supposed to be most abundant and extending over a period of two years, the average depth during the winter was found to be 7.7 in. in 1922-23 and 10.1 in. in 1925-26. It is pointed out that wireworms were frequently found above a depth of 6 in. even in mid-winter, where they encountered much colder conditions than those deeper in the soil, some of which went to a depth of 36 in. Thus the frequent recommendation for control of fall plowing to expose the wireworms to the rigors of winter may have less value than is usually attached to such a farm practice.

The host-selection principle as applied to *Bruchus quadrimaculatus* Fab., A. O. LARSON (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 1, pp. 37-78, pl. 1).—The author reports upon a series of experiments commenced in 1919. It was found that *B. quadrimaculatus*, while normally breeding in cowpeas, can develop in many varieties of leguminous seeds. Oviposition takes place more freely on well matured seeds of any variety than on unmaturing or broken seeds of the same variety. The adults show a marked predilection for well filled seeds having a smooth polished seed coat but no special preference for the host in which they have bred, and it appears that continued breeding in a host does not intensify the preference for that host. The adult oviposits as freely on hosts which are unfavorable for larval development as on hosts which are favorable for such development. The species does not appear to be able to breed in any variety of common garden beans.

An introduced cabbage weevil, P. J. CHAPMAN (*Jour. Econ. Ent.*, 20 (1927), No. 4, p. 645).—The author records the destruction of seedling cabbage plants in a small field near Hartsdale, Westchester County, N. Y., in June by *Ceutorhynchus erysimi* Fab., a European pest not heretofore recorded from the United States.

The development of the larval and adult mid-gut of *Calandra oryzae* (Linn.): The rice weevil, K. MANSOUR (*Quart. Jour. Micros. Sci.* [London], n. ser., 71 (1927), No. 282, pp. 313-352, pls. 5, fig. 1).—This is a report of embryological studies, and includes a bibliography of four pages.

The leaf cutting ant of Panama and means of control [trans. title], A. DÍAZ G. and J. ZETEK (*Bol. Agr. [Panama]*, 1 (1926), No. 8, pp. 21, pls. 13).—In the first part of this paper the insect and its habits are described (pp. 4-7), and in the second part control is dealt with (pp. 7-11) by Zetek. In part 3 control by fumigation with Cyanogas is considered by Díaz G. (pp. 11-21).

The utilization of carbohydrates by honeybees, E. F. PHILLIPS (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 5, pp. 385-428).—This account is based upon feeding experiments conducted by the author while with the U. S. D. A. Bureau of Entomology.

The author concludes that "of the monohexose sugars, bees utilize as food glucose and levulose, but not galactose and probably not mannose. Of the disaccharides they utilize sucrose, trehalose, and maltose but not lactose. Of the trisaccharides they utilize melezitose but not raffinose. They fail to utilize as food the more complex polysaccharides dextrin, starch, or inulin. It is evident from the fact that they do not die more rapidly when given the glucosides containing hydrogen cyanide as a constituent that bees lack the enzyme emulsin. They do not utilize glycerin, mannite, or the four pentose sugars, rhamnose, xylose, *D*-arabinose, and *L*-arabinose. They can live on commercial glucose for a time from the dextrose and maltose present, but show a pronounced dislike for this material, and it does not serve as a safe food. They can live on brown sugar, but practical experience in the apiary shows its unsuitability for winter feed. Honeydew contains sugar which bees utilize but it is unsafe for the winter. Honey, even the rather inferior type used in this experiment, is as good as any food material for bees, and there is reason to believe, from data not herein contained, that it is far better for bees at certain times of year than any artificial sugar obtainable. Interpreting these findings in terms of enzymes, it appears that the honeybee contains invertase, maltase, and trehalase, but not lactase, emulsin, inulose, amylase (diastase), and dextrase, if this is to be separated from amylase. No evidence is herein contained on enzymes other than those which are connected in the hydrolizing of carbohydrates.

"From the point of view of practical beekeeping, the absence of enzymes of the amylase-dextrase group is of first importance, and the work here recorded supports the theory that dysentery in winter is caused by the indigestibility of dextrans in the winter food supply, and the consequent accumulation of this material in the rectal ampulla as fecal material."

A list of 83 references to the literature is included.

The utilization of carbohydrates as food by honeybee larvae, L. M. BERTHOLF (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 5, pp. 429-452, figs. 11).—The author finds the honeybee larvae able to utilize as food the following carbohydrates, named in the order of their apparent food value: Sucrose, levulose, maltose, melezitose, dextrose, trehalose, dextrin, galactose, and lactose (the last very slightly). This fact indicates that the larva has available the digestive enzymes invertase, maltase, melezitase, trehalase, dextrinase, and lactase.

Honeybee larvae apparently differ from adult honeybees in their ability to use dextrin and galactose, according to Phillips,⁸ and lactose, according to Phillips and Pavlovsky and Zarin (E. S. R., 48, p. 359). Lactase has, however, been found in the larvae of the brown-tail moth, silkworms, *Hyponomeuta* sp., and yellow meal worms.

"Two carbohydrates which honeybee larvae are not able to use as food are starch and glycogen. The enzyme diastase is, therefore, not present in the lumen of the gut. But the enzyme diastase is present in the coelomic fluid of the larvae, as shown by the ability of the coelomic fluid to digest starch. In this respect, according to Phillips, the larvae are like the adult honeybees; according to all other investigators they are unlike the adults. They are also apparently unlike almost every other insect which has been investigated.

"Larvae are like adults in their ability to metabolize two rare sugars, melezitose and trehalose. Their ability to use trehalose is especially remarkable in view of the fact that this sugar probably never occurs in their normal diet.

"Under the conditions of these experiments honeys show a life-sustaining value slightly less than sucrose, and approximately equal to levulose, maltose, melezitose, and dextrose. The various honeys used ranked in the following order from greatest to least life-sustaining value: Basswood clover, white clover, tulip tree, alfalfa, buckwheat, mountain laurel, sage, wild buckwheat, aster, goldenrod, and locust; the reason for this order of values is not clear, since it is not to be explained on the basis of any known physical or chemical characteristic of the honeys."

A list of 26 references to the literature is included.

Acarine disease and the muscles of the honey bee, G. D. MORISON (*Nature* [London], 120 (1927), No. 3016, pp. 259, 260).—A brief discussion of the pathological appearance of the muscles in this disease of the honeybee.

Status of imported parasites of the European corn borer, D. W. JONES and D. J. CAFFREY (*U. S. Dept. Agr. Circ. 14* (1927), pp. 8, figs. 3).—This is a report upon the importation of parasites of the European corn borer, including the methods employed, number of parasites liberated in several areas, recovery of such parasites, etc. A total of 1,789,080 imported parasites of this pest, representing 12 species, have been liberated in infested fields in the United States. These have been imported particularly from France, Italy, Belgium, and Hungary. Six of the species liberated have been recovered under circumstances which showed that they have become established and are now at work preying upon the corn borer.

Studies of native parasites have shown that in favorable seasons a native egg parasite (*Trichogramma minutum* Riley) destroys many eggs of the second generation of corn borers in New England, but this parasite is rarely found in corn-borer egg collections in the Middle West. Other recorded native parasites attacking the corn borer might be termed accidental parasites, as they normally attack a variety of native insects but at present are practically of no consequence as a help against the corn borer. In the Middle West less than 0.1 per cent, and in New England usually less than 1 per cent, of the borers beyond the egg stage are killed by native parasites.

Description of a new eulophid parasitic on *Bucculatrix canadensisella* Chambers, A. B. GAHAN (*Psyche*, 34 (1927), No. 5, pp. 171-173).—Under the name *Pleurotropis bucculatricis* the author describes a new species found to parasitize *B. canadensisella* at New Haven, Conn.

Parasitism of the sugar cane oregmas (*Oregma lanigera* Zehnt.) by *Encarsia flavoscutellum* Zehnt. [trans. title], E. H. HAZELHOFF (*Arch. Suiker-*

⁸ *Gleanings Bee Cult.*, 52 (1924), No. 2, pp. 76-79.

indus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1927, No. 11, pp. 543-556; Eng. abs., pp. 555, 556).—The percentage of parasitism of the woolly sugar cane aphid by *E. flavoscutellum* on 45 different plantations over the island of Java during February, March, and April, 1927, is reported upon. During these months this parasite was capable of subduing the pest in cane fields within a few weeks after its introduction.

New species of *Sagaritis* with a key to the genus (*Ichneumonidae Hymen.*), G. S. WALLEY (*Canad. Ent., 59 (1927), No. 10, pp. 227-234, figs. 2*).—In addition to tables for the separation of members of this genus of parasites, descriptions are given of six new forms.

Observations on *Euplectrus platyhypenae* How. (*Chalcidae*), a parasite of noctuid larvae, R. C. SMITH (*Bul. Brooklyn Ent. Soc., 22 (1927), No. 3, pp. 128-134, pl. 1*).—This is a contribution from the Kansas Experiment Station on the abundant and effective hymenopterous parasite *E. platyhypenae*.

Parasites and hyperparasites of the sugar cane borer on cane sugar in Tucumán [trans. title], J. BRÈTHES (*Rev. Indus. y Agr. Tucumán, 17 (1927), No. 7-8, pp. 163-166; Eng. trans. in Sugar [New York], 29 (1927), No. 10, pp. 489, 490*).—The author gives descriptions of *Microdus crossi* n. sp., *Ipobracon tucumanus* Brèthes, *Aulatopria tucumana* n. g. and sp., and *Sarcophaga dlatraeae* n. sp.

Notes on the mite *Pediculoides ventricosus* Newport, R. L. TAYLOR (*Psyche, 34 (1927), No. 3-4, pp. 157-163, fig. 1*).—The author reports having lost several hundred hymenopterous parasites of the white pine weevil due to the attack of this mite. It is suggested that the mite is more harmful than is realized, since the parasites it destroys probably would kill more injurious insects than does the mite.

ANIMAL PRODUCTION

Relation of maturity to the nutritive value of first, second, and third cuttings of irrigated alfalfa, J. SOTOLA (*Jour. Agr. Research [U. S.], 35 (1927), No. 4, pp. 361-383, figs. 2*).—A study was made at the Washington Experiment Station to determine the chemical composition, digestibility, and protein utilization of the first, second, and third cuttings of alfalfa. Each of the three cuttings was studied at the one-fourth, one-half, and three-fourths stages of maturity, these stages being determined by bud and blossom count. The digestion trials were made in triplicate, two wethers and one ewe being used in each case. In this manner nine samples of hay collected in 1923 and nine in 1924 were tested. After a 10-day preliminary feed, the lambs were placed in the metabolism crates for 10 days. Quantitative collections of feces and urine were made, and an accurate record of feed, water, and refuse hay was kept.

It was found that in general the protein content decreased and the fiber content increased as the plants matured. The third cutting, at the three-fourths bloom stage, contained the least protein. Averaging all the stages, the second cutting contained the highest percentage of protein, followed in order by the third and first cuttings. The calcium content of alfalfa was from 7 to 11 times greater than the phosphorus content. More calcium was found at the one-half bloom stage than at the other stages. No relationship was noted between maturity and phosphorus content, nor between the number of the cutting and the calcium and phosphorus content. The highest content of digestible crude protein and total digestible nutrients for all the cuttings was obtained in the hay cut at the one-half bloom stage.

On a ton basis, first-cutting hay contained the largest percentage of digestible nutrients, followed in order by the second and third cuttings. On the same basis, second-cutting hay contained the maximum of digestible crude protein, and third-cutting the least. The seasonal yield of total digestible nutrients and digestible crude protein was highest at the one-half bloom stage. The one-fourth bloom stage ranked second in protein, while the three-fourths bloom stage was second in respect to total digestible nutrients. As the plants increased in maturity a lower utilization of crude protein was observed.

The influence of sheep-grazing on hay, W. G. SMITH (*Scot. Jour. Agr.*, 10 (1927), No. 3, pp. 292-297).—Experiments at the farm of the Edinburgh and East of Scotland College of Agriculture showed that grazing late into the spring, as is practiced on many hill farms during the lambing season, reduced the heading power of grasses and the hay crop if the same fields were used for hay. Early overgrazing and then shutting off the sheep at the end of May reduced or prevented the formation of heads in all grasses studied except perennial ryegrass and crested dogstail. Wild white clover survived overgrazing, but the red clovers, with the exception of some of the wild reds, were damaged. When sheep were shut off the pastures in April no harmful effect on heading was observed. Leaving an accumulation of old grass from the previous year on the land reduced the stand of young grass and the number of heads produced by the new grass.

Commercial feeding stuffs, 1926-1927, J. M. BARTLETT (*Maine Sta. Off. Insp.* 124 (1927), pp. 17-36).—The usual report of the guaranteed and found analysis of feeding stuffs officially inspected during the year ended June 30, 1927 (*E. S. R.*, 56, p. 69).

Producing and feeding beef calves, H. M. GARLOCK and J. W. BURCH (*Missouri Agr. Col. Ext. Circ.* 186 (1927), pp. 16, figs. 6).—The authors discuss the advantages of producing calves on the farm under conditions existing in Missouri. The cost of maintaining the breeding herd, methods of handling calves, and feeding for the greatest return are also discussed.

Care and management of sheep in British Columbia, A. KNIGHT, T. P. MACKENZIE, A. MORTON, and C. E. WHITNEY-GRIFFITHS (*Brit. Columbia Dept. Agr. Bul.* 99 (1927), pp. 76, figs. 50).—A popular bulletin dealing with all phases of the sheep industry both on farms and on the range under conditions existing in British Columbia.

Feeding western lambs, C. HARPER (*Indiana Sta. Circ.* 144 (1927), pp. 12, figs. 8).—This publication discusses discrimination in buying feeder lambs, economical feeding, and management to avoid losses as practiced in the feed lots of the station and by farmers of the State.

Sheep feeding.—XV, Fattening western lambs, 1926-1927, C. HARPER (*Indiana Sta. Bul.* 312 (1927), pp. 11).—Four lots of 25 western lambs each were fed for 84 days to determine the value of feeding clover hay once or twice every fifth day, to compare these methods of feeding hay with full feeding clover hay every day, and to compare oats and corn for fattening lambs. In addition to the above feeds, all lots received cottonseed meal and corn silage.

When hay was fed every fifth day the cheapest gains were made in the lot fed hay once a day and the largest gains were made when lambs were fed twice every fifth day. The finish in these two lots was very similar, and the return per lamb approximately equal.

Lambs fed hay every day gained faster, but at no less cost than those fed hay every fifth day (*E. S. R.*, 56, p. 562). The finish was practically equal in these lots, but the lambs fed hay every fifth day made a profit of 50 cts. more per lamb than those full fed hay every day.

Oat feeding increased the rate of gain and decreased the cost of gain slightly. It also reduced the roughage consumption 40 per cent. The finish in the lots fed corn and oats was practically the same, but the financial returns favored oats slightly.

Raisin by-products and bean screenings as feeds for fattening lambs, R. F. MILLER (*California Sta. Bul.* 481 (1927), pp. 16, figs. 4).—The results reported in this publication are divided into two parts, both of which are more complete accounts of work previously noted (*E. S. R.*, 55, p. 357; 57, p. 268).

Reindeer meat: A new source of food, W. C. BARNES (*Producer*, 9 (1927), No. 3, pp. 3-6, figs. 3).—A popular article discussing the introduction and development of the reindeer industry in Alaska. The author discusses the uses and characteristics of these animals, together with their possibilities for the future.

Preparation of kafir corn and wheat for swine feeding: Value of yeast in swine feeding, C. P. THOMPSON (*Oklahoma Sta. Bul.* 165 (1927), pp. 12).—A more complete account of work previously noted (*E. S. R.*, 57, p. 566).

Swine questions answered, W. H. PETERS (*St. Paul, Minn.: Webb Book Pub. Co.*, 1927, pp. 141, figs. 19).—This is a compilation of questions and the answers on the subject of hog raising, grouped under the headings of breeding, feeding, pastures, diseases, and miscellaneous.

A profitable plan in producing pork—suggestions in raising ton litters, G. SELLARDS (*Ky. Agr. Col. Ext. Circ.* 211 (1927), pp. 24, figs. 13).—The author discusses a plan for raising pigs, especially in relation to producing ton litters. The details of management of the breeding stock and the pigs from birth to maturity are pointed out. Suggestions are made for inexpensive equipment necessary for the production of hogs.

Experiments on nutrition.—VII, Fat-soluble vitamin requirements of chickens, R. H. A. PLIMMER, J. L. ROSEDALE, and W. H. RAYMOND (*Biochem. Jour.*, 21 (1927), No. 4, pp. 940-944).—In studies at the St. Thomas's Hospital Medical School, London, it was found that chickens on rations of white rice and dried yeast or on corn with fish meal as the protein supplement require fat-soluble vitamin. On both rations a minimum requirement of 0.5 per cent of cod-liver oil was determined. Since cod-liver oils vary in their vitamin content, the authors recommend that 1 per cent be taken as the smallest requirement.

The effect of irradiation and cod liver oil upon poultry, E. W. MERCER and F. H. W. P. TOZER (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 7, pp. 624-626).—Five pens of six Rhode Island Red hens in their second laying season, together with a male bird, were fed at the Berks and Bucks Joint Sanatorium, England, to determine the effect of irradiation and cod-liver oil upon production. The hens had been trap-nested during their pullet year and had produced between 170 and 190 eggs each. Each lot was housed separately, with ample floor and air space, and each group had access by day to grass runs of approximately 0.125 acre under fruit trees.

All lots received 2 oz. of mixed meal and 2 oz. of equal parts wheat and crushed corn per bird per day, with green stuff ad libitum. The mixed meal consisted of toppings, ground oats, Uveco poultry food, corn meal, and fish meal 5:1:1:1:0.5. This basal ration was fed to the birds in lot 1 as a control. Lot 2 received in addition 5 cc. of untreated cod-liver oil. In lot 3 the toppings were exposed to ultra-violet light for 15 minutes at 9 in. The birds in lot 4 received 5 cc. of olive oil containing freshly irradiated cholesterol which had been exposed for 0.5 hour at a distance of 1 ft. to ultra-violet light, each bird receiving 25 mg. of cholesterol per day. In lot 5 the birds were exposed for 15 minutes daily at a distance of from 18 to 24 in. to the rays of a mercury vapor lamp.

The number of eggs produced in the various pens from January 14 to March 31 was 259, 237, 232, 221, and 211, respectively. All eggs were of standard size except 6 small eggs containing no yolk laid by lot 5. These results led the authors to conclude that farm poultry kept under healthy, open-air conditions, with suitable rations and plenty of green stuff, will not have their egg production increased by the addition of cod-liver oil or by irradiating the birds or their feed.

The value of certain scratch grains in the poultry ration, R. PENQUITE, R. B. THOMPSON, and H. R. NAYLOR (*Oklahoma Sta. Bul. 166* [1927], pp. 8, figs. 5).—This is a more detailed report of work previously noted (E. S. R., 57, p. 567).

Culling for egg production, H. L. KEMPSTER (*Missouri Agr. Col. Ext. Circ. 188* (1927), pp. 16, figs. 18).—Popular directions, assisted by illustrations, are given for culling for egg production.

DAIRY FARMING—DAIRYING

The relation between the vitamin B content of the feed eaten and of the milk produced, S. I. BECHDEL and H. E. HONEYWELL (*Jour. Agr. Research* [U. S.], 35 (1927), No. 3, pp. 283–288, fig. 1).—The milk from three cows that had been fed for over two years at the Pennsylvania Experiment Station on rations deficient in vitamin B was fed to rats to determine its potency for vitamin B. The cows had been fed the following feeds: Dried sugar-beet pulp, corn gluten, pearled hominy from white corn, polished rice, cornstarch, casein, cane sugar, bone meal, and a mineral mixture. Cod-liver oil fed daily supplied the fat soluble vitamins. One cow had had a vitamin B supplement (marmite yeast) added to her ration at one time, but it was found unnecessary for growth and well-being, and it was dropped from the ration about 300 days before calving. The rats were put on a vitamin B-free basal ration at an average age of 24 days. Daily allowances of milk from the above cows were fed to lots of rats at the rate of 8, 10, 12, 16, and 20 cc. per rat. Two drops of cod-liver oil was added to the daily allowance of milk, and iodine was supplied in the drinking water.

The lots fed 8 and 10 cc. of milk did not grow normally during the test, although they gained in weight for the entire period, and there was no tendency toward pathological conditions. Groups fed the larger amounts grew normally. The vitamin B potency of this milk was found equal to that of herd milk from cows fed a good winter ration.

The results led the authors to conclude that vitamin B in the milk is not dependent upon the presence of the vitamin in the ration. It appears that cows and possibly all ruminants possess the power to synthesize vitamin B. This possibility is being tested to determine whether this synthesis is due to micro-organisms normally present in the rumen.

Utilization of the grain in kafir and cane silage by dairy cows, R. B. BECKER and W. D. GALLUP (*Oklahoma Sta. Bul. 164* (1927), pp. 7; also in *Jour. Agr. Research* [U. S.], 35 (1927) No. 3, pp. 279–282).—To determine what percentage of kafir and cane seed in silage passes through the digestive tract untouched, two lots of four cows each were fed on these types of silage. In addition to the silage the cows received a ration of alfalfa hay and a mixed ground grain and protein supplement. A 20-day preliminary period preceded the 10-day experimental period, during which all manure was collected. The total amount of grain in a large quantity of silage was secured by mechanical

separation, using sieves, water, and a fan. The seeds voided by the cows were also secured by mechanical separation. The weight of the grain was made on an air-dry basis. Chemical analyses were made to determine what losses of nutrients had occurred in the digestive tract.

It was found that 33.91 per cent of the cane seed and 49.46 per cent of the kafir grain were voided in the feces. The hulls on the seeds were reduced from 13.75 to 0.5 per cent in the case of kafir and from 5.77 to 4.2 per cent in the case of cane seed during passage through the digestive tract. Chemical analyses showed little utilization of nutrients in the kernels during passage through the digestive tract. Some fats were digested, but small amounts of protein were utilized. The effect upon crude fiber was variable. There was a slight increase in the ash content of the seeds after passage through the digestive tract, due probably to absorption of certain salts in the digestive juices.

The authors recommend heading kafir and cane before ensiling these crops and feeding the grain ground as the concentrate portion of the ration when such economic factors as labor facilities and the value of the grain warrant this practice.

The production value of feeds made from fish, IV, V [trans. title], H. ISAACHSEN and O. ULVESLI (*Meld. Norges Landbr. Høiskole*, 6 (1926), No. 6-7, pp. 369-404; *Eng. abs.*, pp. 400-402; 7 (1927), No. 2, pp. 77-95; *Eng. abs.*, pp. 92, 93).—Two studies are reported.

IV. *Herring meal*.—In order to determine its value for milk production, two varieties of meal were fed, one made of whole, slightly salted herring, by boiling, pressing, drying, and grinding, and the other obtained from rather strongly salted spring herring, usually with some addition of herring waste.

Meal No. 1 was tested for 2 years, the first year with 2 lots of 19 cows each and the second year with 2 lots of 18 cows each. During a preliminary period both groups were fed the same ration, consisting of fodder and peanut cake. In the second period the peanut cake was replaced by herring meal in the ration of 1 group, and in a third period the rations were returned to the original. The average of the 2 years showed that 1.57 lbs. of herring meal was equal to 2.203 lbs. of standard barley (0.71 kg. to 1 feed unit). The digestibility of this meal was determined with 4 sheep as organic matter 91, protein 88, and fat 95 per cent.

The herring meal rich in salt was tested for 3 years, using 2 groups each year of 5, 16, and 20 cows, respectively. The feeding plan was the same as above, except that during the first 2 tests this meal was compared with herring meal low in salt, and the third year with peanut meal. The value of the meal for 3 years was 1.98, 1.87, and 1.8 lbs., respectively, as compared with 2.203 lbs. of standard barley (0.9, 0.79, and 0.85 kg. to 1 feed unit). Digestibility tests of this meal with sheep gave the same coefficients as above.

The percentage of fat in the milk was irregularly affected by the herring meal with a low salt content, depending upon the amount of meal fed and its fat content. No difference was noticed in the percentage of fat in milk in tests with herring meal rich in salt.

V. *Fishmeal*.—Two series of tests were conducted to determine the value of fish meal prepared from the ground air-dried heads and spinal columns of cod. In the first tests 2 groups of 10 cows and in the second tests 2 groups of 16 cows each were used. The method of feeding was similar to the preceding study except that the fish meal was compared with cotton cake. One sample of meal used was found to be too low in protein and too high in fat and ash, and was thought to have been adulterated with liver meal and bone meal.

The value of the adulterated sample was 2.42 lbs. to 2.203 lbs. of barley (1.1 kg. to 1 feed unit). The second meal had a value of 2.53 lbs. to 2.203 lbs. of barley (1.15 kg. to 1 feed unit). The following coefficients of digestibility were determined for fish meal with sheep: Protein 90 per cent and fat 95 per cent. The percentage of fat in the milk was not affected by fish meal.

Feeding dairy cows in summer, J. R. DAWSON (*U. S. Dept. Agr. Leaflet 7* (1927), pp. 6, figs. 7).—The author points out that a high-producing cow can not eat enough grass to meet her body requirements and keep up production and that she, therefore, needs grain. During the summer months, feeding succulent feeds when pastures are poor, using supplementary pasture crops, and proper care of pastures are recommended.

Productivity of Guernsey cows of American or Island origin, J. W. GOWEN (*Maine Sta. Bul. 341* (1927), pp. 215-228, fig. 1).—Using the Advanced Registry of Guernsey cattle as a basis, the author has made a comparison of the average age corrected production of American and imported cows, cows whose sires were imported, and cows whose dams were imported to determine the value of American and Island breeding. A comparison is also made of the age corrected production of the daughters of American and imported or Island sires. The results given in tabular form appear to show that the American Guernseys are equal to those found on the Island of Guernsey. The individuality of the animal proved to be more important than its place of origin.

The deferred short-time test as a measure of the performance of dairy cows, W. L. GAINES (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 3, pp. 237-249, figs. 4).—At the University of Illinois the advanced registry of the Holstein and Guernsey breeds was used to obtain the evidence which they afforded as to the possibility of eliminating the objectionable features of the short-time test by deferring its application to a comparatively late stage of lactation. The objections to the seven-day test conducted shortly after calving are (1) that the fat percentage obtained is not representative and (2) that the record is not dependent on persistency of lactation.

By the use of statistical methods, the author has found that the objections on the score of the fat percentage may be overcome by deferring the test to 60 days or more after calving. The objections on the basis of persistency may be overcome by deferring the test to the fifth month of lactation. If the short-time test is conducted during the fourth month of lactation it gives the best representation of the useful lactation capacity of the cow.

A comparison of the temperature and bacterial count of milk and foam during certain stages of the pasteurization process, H. A. WHITTAKER, R. W. ARCHIBALD, C. S. LEETE, and L. F. MILLER (*U. S. Dept. Agr. Tech. Bul. 18* (1927), p. 12, fig. 1).—In cooperation with the Minnesota Department of Health and the department of physics of the University of Minnesota, the Bureau of Dairy Industry made observations on the effect of pasteurization on milk and foam on 19 separate runs at pasteurizing plants. Five hundred and seventy-eight temperature readings were made with a thermocouple of the temperature of the milk, foam, and air above the foam. Readings were made when possible at the beginning, middle, and end of the holding period. Comparisons were made of the bacterial count of the milk and foam, the butterfat content in relation to bacterial count, the effect of agitation during holding upon the bacterial count, the position of covers, and the relationship between amount of foam and bacterial count.

The depth of foam in these studies varied from 0.5 to several inches and in amount from small islands to the entire surface of the vat. During the holding period the temperature of the foam was lower in every case than

that of the corresponding milk, 84.2 per cent of the tests being 5° F. or more lower. The same was true in 73.3 per cent of the tests at the middle and in 84.6 per cent at the end of the holding period. The temperature of the air above the foam varied from 6.6 to 27.8° lower than that of the milk.

The bacterial count of the foam was much higher in every case than that of the milk at the beginning and at the end of the holding period. Of the foam samples 66.7 per cent gave a higher bacterial count after holding than before, the average increase in these samples being 176.3 per cent. Foam from different locations in the tank varied in their bacterial count, and the depth of the foam layer had no marked effect upon the bacterial count or upon the reduction of the count during the holding period.

In nearly all the tests the butterfat content of the foam was higher than that of the corresponding milk samples, and the butterfat percentage was usually higher in samples taken at the end of the holding period. No apparent relationship existed between the butterfat content and the bacterial count. When the covers of the vats were closed during pasteurizing the bacterial count of the foam was lowered, while when the covers were open or loose fitting an increase was shown in the count. In the closed vats the temperature of the foam increased approximately 3° during the holding period, while no increase was noted in vats with the covers opened. This study showed that pasteurizing was not effective in raising the foam to a satisfactory pasteurizing temperature or in accomplishing as great a destruction of bacteria in the foam as in the milk.

Better farm butter, G. M. TROUT and J. V. HOPKINS (*West Virginia Sta. Circ. 46* (1927), pp. 24, figs. 10).—The steps in the making of good farm butter are discussed. This includes the handling of the cream, the necessary equipment, churning, washing, working, salting, printing, and wrapping. A score card for butter and the requirements necessary for the marketing of farm butter under the Mountain State Brand are appended.

Making and storing farm butter for winter use, W. WHITE (*U. S. Dept. Agr. Leaflet 9* (1927), pp. 6, figs. 3).—Popular directions are given for pasteurizing cream, churning, washing, salting, and storing butter during the summer for winter use on the farm.

Thirteenth annual report of the creamery license division for the year ending March 31, 1927, T. H. BINNEY (*Indiana Sta. Circ. 145* (1927), pp. 16, figs. 2).—This is the usual report of the State creamery license division (*E. S. R.*, 56, p. 569). The comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers are discussed. Appended is a list of the licensed manufacturing plants of the State.

VETERINARY MEDICINE

Report of the New York State Veterinary College at Cornell University for the year 1925-1926 (*N. Y. State Vet. Col. Rpt. 1925-26*, pp. 196, figs. 16).—The reports of clinics and research presented in the appendix to this report (*E. S. R.*, 55, p. 574) are as follows:

Report of the Ambulatory Clinic from July 1, 1925, to June 30, 1926, by D. H. Udall, E. R. Cushing, and M. G. Fincher (pp. 27-29); **Laboratory Examinations for Ambulatory Clinic**, by H. L. Gilman (p. 30); **Report of the Surgical and Consulting Clinic**, July 1, 1925, to June 30, 1926, by J. N. Frost and H. B. McMurray (pp. 31, 32); **Report of the Small Animal Clinic**, July 1, 1925, to June 30, 1926, by H. J. Milks and H. C. Stephenson (pp. 33-35); **Report of the Diagnostic Laboratory for the Year Ending June 30, 1926**, by C. M. Car-

peniter, C. J. Parshall, and D. W. Baker (pp. 36-49), including a Preliminary Report of Studies of *Brucella abortus* Infection in Man (pp. 40-49); Report of the Diagnostic Work on Poultry Diseases at Ithaca, July 1, 1925, to June 30, 1926, by E. L. Brunett (pp. 50-53); Report of the Poultry Disease Diagnostic Laboratory at Farmingdale, Long Island, July 1, 1925, to June 30, 1926, by J. M. Hendrickson (pp. 54-60) (E. S. R., 57, p. 674); The Interpretation of Clinical Symptoms, by D. H. Udall (pp. 61-69); Convulsions in Dogs, by H. J. Milks (pp. 70-75); A Comparison of the Blood of a Normal and Two Castrated Billy Goats, by P. A. Fish and C. E. Hayden (pp. 76-80); The Agglutination Test as an Aid in Handling Bang Abortion Disease, by R. R. Birch and H. L. Gilman (pp. 81-85); Bang Abortion Disease in Cattle, by R. R. Birch and H. L. Gilman (pp. 86-102); Technique of Drawing Blood Samples from Cattle for the Agglutination Test, by R. R. Birch (pp. 103-105); Immunizing Young Pigs against Hog Cholera, IV, by J. W. Benner (pp. 106-117); The Passage of *Bacterium abortus* through the Digestive Tract of Cattle, by H. L. Gilman and R. R. Birch (pp. 118-120); Directions for Collecting Blood Samples for the Agglutination Test for Infectious Abortion, by C. M. Carpenter (pp. 121-124); The Value of Placental Examination for the Diagnosis of Infectious Abortion of Cattle, by W. A. Hagan (pp. 125-130); Bacillary White Diarrhea, by E. L. Brunett (pp. 131-145) (E. S. R., 57, p. 675); The Differentiation of *Bact. pullorum* (Rettger) and *Bact. sanguinarum* (Moore), by J. M. Hendrickson (pp. 146-172) (E. S. R., 57, p. 674); Undulant Fever in Man Associated with Bacteria Indistinguishable from *Brucella abortus*, by V. A. Moore and C. M. Carpenter (pp. 173-177) (E. S. R., 55, p. 575); Agglutinins for *Brucella abortus* in the Blood Serum of Man, by C. M. Carpenter (pp. 178-181) (E. S. R., 55, p. 576); A Comparison of Strains of *Brucella abortus* Isolated from Man with Those from Cattle, by C. M. Carpenter (pp. 182-185) (E. S. R., 55, p. 575); and Growth of Veterinary Science and the Application of New Knowledge, by V. A. Moore (pp. 186-193).

A history of the Royal Army Veterinary Corps, 1796-1919, F. SMITH (London: Baillière, Tindall & Cox, 1927, pp. XII+268, pls. 24).—Following the introduction this work deals with the army farrier, 1600-1796 (pp. 5-26); the genesis of the Army Veterinary Service and the Coleman administration, 1796-1839 (pp. 27-111); administration under Cherry and Wilkinson, 1839-1876 (pp. 112-160); and the evolution of the Army Veterinary Service, 1876-1919 (pp. 161-241). Additional information is presented in five appendixes.

Report of the director of veterinary research for the year 1925 (*Rhodesia Agr. Jour.*, 23 (1926), No. 7, pp. 600-612).—This report deals with the work with infectious diseases and parasites during the year.

Report of the Civil Veterinary Department, Assam, for the year 1926-27, G. P. SEN ET AL (*Assam Civ. Vet. Dept. Rpt. 1926-27*, pp. [1]+15+2).—This is the usual annual report (E. S. R., 55, p. 776).

A manual of autopsy technique and anatomic-pathological diagnosis in veterinary medicine, L. LEINATI (*Manuale di Tecnica delle Autopsie e Diagnostica Anatomico-patologica Veterinaria*. Milan: Istituto Steroterapico Milanese, 1927, pp. VIII+234, pls. 8, fig. 1).—A handbook of procedure.

Text-book of bacteriology, W. W. FORD (*Philadelphia and London*; W. B. Saunders Co., 1927, pp. 1069, pls. 9, figs. 186).—In this work the author attempts to give complete and accurate descriptions of the microorganisms commonly encountered in medicine, comparative pathology, and hygiene and public health. Part 1 is devoted to general bacteriology (pp. 17-181), part 2 to systematic bacteriology (pp. 182-787), part 3 to distribution of bacteria (pp. 788-825), part 4 to infection and immunity (pp. 826-924), part 5 to the Spirochetes (pp. 925-

1002), and part 6 to infectious microorganisms of undetermined character (pp. 1003-1052).

An apparatus for motion photomicrography of the growth of bacteria. S. BAYNE-JONES and C. TUTTLE (*Jour. Bact.*, 14 (1927), No. 3, pp. 157-173, pls. 2, figs. 2).—The author describes a new apparatus for motion photomicrography which is relatively simple and has been constructed in part from stock materials, using the Model A Ciné kodak to secure compactness and the advantages of the cheapness and photographic quality permitted by the 16-mm. film. With this apparatus films have been obtained which show the growth of *Penicillium* and *Bacillus megatherium*, and the movements of *Entamoeba histolytica*.

Filterable viruses: A critical review. T. M. RIVERS (*Jour. Bact.*, 14 (1927), No. 4, pp. 217-258, pl. 1).—This is a contribution from the hospital of the Rockefeller Institute read before the Society of American Bacteriologists, December 29, 1926. It is pointed out that in the majority of virus diseases a close relationship between the etiological agents and the cells of the hosts exists. This intimate type of parasitism is emphasized by the fact that some of the diseases exhibit a striking species specificity, that the viruses have resisted cultivation in the absence of living cells, that characteristic or specific pathological changes are frequently observed in cells affected by viruses, and, finally, that a host once recovered from a virus disease usually exhibits a lasting immunity.

A bibliographical list of 410 references, arranged by viruses, is included.

Further investigations of the relation between the chemical constitution and the germicidal activity of alcohols and phenols. J. M. SCHAEFFER and F. W. TILLEY (*Jour. Bact.*, 14 (1927), No. 4, pp. 259-273).—The present paper reports the results of work with alcohols and phenols and with various resorcinols and the corresponding intermediate ketones, and is similar to the work with other alcohols and phenols previously noted (E. S. R., 56, p. 572). The earlier conclusion that the bactericidal power of the alcohols and phenols increases so uniformly with the molecular weight that the rate of increase may be expressed by definite numerical ratios was confirmed.

Intravenous injections of colloidal carbon in human and veterinary medicine. R. L. CONKLIN (*Sci. Agr.*, 8 (1927), No. 2, pp. 112-118, fig. 1).—The author reports that the suspension of colloidal carbon has been used very successfully and extensively in the treatment of over 100 cases of septicemia (joint-ill), metritis, mastitis, lymphangitis, and external pyogenic wounds. It has been employed chiefly in domestic animals, but has been used in man as well. It is suspended in sterile water in the absence of protective colloids in order to increase its sensitiveness, and if suspended in a saline solution flocculation might occur due to the electrolyte. It may be sterilized without danger of alteration. Case reports are included.

Carbon tetrachloride in the treatment of parasitic affections of domestic animals. R. [A. R.] RICHARD (*Le Tétrachlorure de Carbone dans le Traitement des Affections Parasitaires des Animaux Domestiques. Thèse, Univ. Paris; Lyon: Bosc Bros. & Riou, 1926, pp. 75*).—Following an introductory account this work reports briefly upon the physical and chemical properties of carbon tetrachloride, its industrial and medicinal uses (pp. 11-16); an experimental study of carbon tetrachloride (pp. 17-33); a therapeutic study of it (pp. 35-58); dosage and methods of administration (pp. 59-64); and advantages and objections to its use (pp. 65-70). A list is given of 31 references to the literature.

The relation of the hydrogen ion concentration of egg white to its germicidal action. P. F. SHARP and R. WHITAKER (*Jour. Bact.*, 14 (1927), No. 1, pp. 17-46, fig. 1).—The authors find that the germicidal action of raw egg white

is markedly influenced by the hydroxyl-ion concentration, which increases rapidly during the first few days of storage of untreated eggs in a ventilated room. The hydroxyl-ion concentration of the white corresponding to that at the time the egg was laid permitted growth, while the hydroxyl-ion concentration corresponding to the whites of eggs aged a few days in air was germicidal to the following organisms: *Bacterium coli*, *Pseudomonas pyocyaneus*, *Serratia marcescens*, *Proteus vulgaris*, *Pseudomonas fluorescens*, *Bacillus cereus*, *B. megatherium*, and *B. mycoides*. The conflicting results of previous workers may be partially explained on the basis that they did not take into account the age of the egg, and consequently the hydroxyl-ion concentration, when testing for the germicidal action of egg white. For vegetative cells of the strain of *Bacillus subtilis*, which the authors used, normal egg white at all hydrogen-ion concentrations was decidedly bactericidal, while the spores were more resistant. Heat and alcohol coagulation of the egg white destroyed its germicidal action on the vegetative cells of *B. subtilis*. The toxic substance which kills the vegetative cells of *B. subtilis* can be separated from egg white by dialysis, the diffuseate gradually becoming nongermicidal on standing.

Treating poisonous spider bites with antitoxin, S. P. MOORE (*Nation's Health*, 9 (1927), No. 7, pp. 45-47, figs. 4).—Reference is made to work at Sao Paulo, Brazil, in which, through the progressive inoculation of sheep, a highly active antiserum for the venom of two species of spiders has been developed.

A contribution to helminthic therapy, M. FERNÁN-NÚÑEZ (*Jour. Amer. Med. Assoc.*, 88 (1927), No. 12, pp. 903-905; *abs. in Vet. Med.*, 22 (1927), No. 6, pp. 227-229).—Reporting upon the administration of vermifuges, it is pointed out that oil of chenopodium by intramuscular or intravenous injection is specific against *Trichocephalus* and *Oxyuris*. Arsphenamines given intravenously will often expel intestinal nematodes, but their field as vermifuges is very limited. Extracts of eggs of *Trichocephalus* injected into dogs at 3-day intervals for 1 month apparently conferred an immunity against trichocephaline reinfestation for periods varying from 7 to 12 months. While a *Trichocephalus* vaccine has only a limited application in man, its possibilities in veterinary practice are worthy of careful consideration. The success of a vaccine against *Trichocephalus* may serve as a basis for the production of vaccines against other helminths.

Viability of *Ascaris suum* ova exposed to weather conditions, H. B. RAFFENSPERGER (*Vet. Med.*, 22 (1927), No. 6, pp. 221-226, figs. 4).—This contribution from the U. S. D. A. Bureau of Animal Industry reports upon a series of experiments conducted at Chicago, in which ova obtained from gravid female ascarids (*Ascaris suum*) were spread over the top of the soil in tiles covered by wire screen and exposed to the weather. The tests covered the years 1923, 1924, and 1925.

A few of many eggs placed on soil on September 29, 1923, showed embryos a year later, some of which were active, indicating the possibility of survival of some eggs for a year under the existing conditions. These conditions involved exposure to a maximum air temperature of 94° F. and a minimum air temperature of -16°. With eggs placed on soil in October, 1924, all were dead a year later. Live eggs were found 301 days after exposure to weather conditions, but no further examinations were made until 365 days had expired. The conditions involved exposure to a maximum air temperature of 98° and a minimum air temperature of -13°, the soil temperature not being ascertained. Of ascarid eggs on soil at Chicago for 164 days, from April 1, 1925, to September 12, 1925, all eggs examined were found dead, indicating that under the existing circumstances all eggs might perish in the course of from 5 to 6 months from spring

to fall. The conditions involved exposure to a maximum air temperature of 98° and a minimum air temperature of 34°.

Botulism in the domestic animals [trans. title], A. THEILER and E. M. ROBINSON (*Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 31 (1927), No. 3, pp. 165-220, pls. 3).—This is a summary of knowledge of botulism in the domestic animals. The subject is dealt with under the headings of general considerations, in which its history is taken up; review of the literature on botulism in equines, ruminants, and fowls (limberneck), respectively; etiology, including the cultural characteristics of strains of the organism as reported by various investigators; natural occurrence, including toxicity of the several strains for various animals; symptomatology, including the several forms observed in equines, bovines, goats, sheep, ostrich, fowls, and rabbits and guinea pigs; immunity and resistance; pathological anatomy; pathogenesis; and treatment and prevention. Reference is made to the literature, a list of 42 references to which is included.

On the relationship of *M. melitensis* and *B. abortus*, C. CERBUTI (*Jour. Trop. Med. and Hyg. [London]*, 30 (1927), No. 18, pp. 230, 231).—The author concludes that cases of Malta fever found in countries like Piedmont, Italy, where the human infection is evidently connected with contagious abortion, are due not to the bacillus of Bang but to the *M. melitensis* of Bruce. To avoid the confusion arising from the name "*melitensis*," and considering its pathogenicity to man, producing, as it does, undulant fever, and in the case of animals abortion, often epizootic in character, it should, in the author's opinion, be given the name of *Brucella melitensis-abortus* Bruce, 1887.

The relationship of undulant fever of man to epidemic abortion of animals, P. W. BASSETT-SMITH (*Jour. Roy. Naval Med. Serv.*, 13 (1927), No. 4, pp. 258-263, figs. 3).—This is a paper read at the Ghent Congress of the Royal Institute of Public Health in 1927. The author points out that while conveyance of undulant fever, as known in Europe, is generally due to infection from goats or sheep, a bovine infection is possible. He concludes that there is little in favor of the theory that *Brucella abortus* and *B. melitensis* are the same organism with the virulence altered by passage through different animals.

Concerning human infection with Bang bacillus [trans. title], E. KREUTER (*Klin. Wchnschr.*, 6 (1927), No. 29, pp. 1380, 1381).—The author reports a case of undulant fever in man caused by *Bacillus abortus*.

Investigations of bovine infectious abortion during the last two decades [trans. title], W. ZWICK (*Arb. Reichsgesundtsamt. [Germany]*, 57 (1926), pp. 360-373).—A review in connection with a list of 92 references to the literature.

Immunization of cows against abortion [trans. title], K. BÜCHLI (*Tijdschr. Diergeneesk.*, 54 (1927), No. 19, pp. 897-904; *Ger., Eng., Fr. abs.*, p. 904).—The author finds that preventive injections of living virulent cultures of *Bacterium abortum* in the usual doses are not dangerous. The treatment appears to be successful, although the number of experiments was too small to draw definite conclusions.

The value of non-specific agglutination in the differentiation of the genus *Brucella*, G. R. ROSS (*Jour. Hyg. [London]*, 26 (1927), No. 3, pp. 279-284).—The author reports that nonspecific agglutination as tested by thermoagglutination, peptone agglutination, lactic acid agglutination, and Michaelis' acid agglutination failed in the primary object of differentiating between *B. melitensis* and *B. abortus*. Thermoagglutination was observed only in strains of *B. paramelitensis*. With peptone agglutination no strain gave a positive result. The results of lactic acid agglutination and Michaelis's acid agglutination ran practically parallel. No distinction could be observed between *B. meli-*

tensis and *B. abortus*. Strains of both of remote origin gave slight agglutination with lactic acid, while recently isolated strains of *B. abortus* were negative. Very definite agglutination, however, was observed by both methods with *paramellitensis* and *para-abortus* strains, but no differentiation was possible between such strains.

Coccidiosis in mammals, J. M. ANDREWS (*Amer. Jour. Hyg.*, 6 (1926), No. 6, pp. 784-798).—This is a report of studies of coccidiosis in cats, in which the incubation period was from 2 to 4 days, the duration of symptoms usually not exceeding a week. The prepatent period was usually 5 or 6 days, and the patent period averaged about 30 days. There was some indication that the severity of the infection varied directly with the numbers of oocysts originally inoculated. One attack of coccidiosis seems to render cats and dogs non-susceptible to subsequent infection by the same organism, the immunity lasting for several months and probably for life.

On the occurrence of coccidia in sheep and goats in Java [trans. title], O. NIESCHULZ and S. A. S. PONTO (*Nederland, Indische Bl. Diergeneesk.*, 39 (1927), No. 4, pp. 332-334; *Ger. abs.*, p. 334).—An examination of the feces of 50 sheep and 50 goats from the Buitenzorg district showed them all to be infected, about 25 sheep and 21 goats severely so. The oocysts resembled *Eimeria faurei* and *E. arloingi* in form and size, but in some sheep larger oocysts were also found which in color and size resembled those of *E. intricata*.

The treatment of coccidiosis of bovines with ichtargan [trans. title], W. L. YAKIMOFF (*Bul. Soc. Path. Exot.*, 20 (1927), No. 7, pp. 588, 589).—The administration of ichtargan twice daily in doses of 1 gm. dissolved in a liter of water has resulted in the control of the dysentery accompanying coccidiosis in 2 or 3 days, and the disappearance of oocysts from the feces. Even grave cases of hemorrhagic colitis disappear very quickly. In the treatment of simple cases of diarrhea a single dose of 1 gm. may be sufficient. It is pointed out that coccidiosis of bovines in Russia is due to two forms, *Eimeria zürni* Riv. and *E. smithi*, and that the mortality may run as high as 50 per cent of the cases.

Johne's disease (also known as chronic bacterial dysentery, paratuberculosis, etc.), J. N. SHOEMAKER (*Vet. Alumni Quart. [Ohio State Univ.]*, 15 (1927), No. 2, pp. 35-39, fig. 1).—A summary of information on this disease.

The wild rat as a carrier of organisms of the paratyphoid-enteritidis group, E. VERDER (*Amer. Jour. Pub. Health*, 17 (1927), No. 10, p. 1007).—The author reports upon 10 organisms belonging to the paratyphoid-enteritidis group isolated from 6 of 100 rats obtained from packing houses in Chicago. In four rats the liver and spleen were found infected with *Bacillus enteritidis*, but only the spleen of a fifth. *B. aertrycke* was isolated only once, it being found in the spleen in pure culture but in no other organ examined. In no instance were the organisms isolated from the intestinal tract of the infected rats.

Studies on a paratyphoid infection in guinea pigs.—III, A second type of *Salmonella* naturally appearing in the endemic stage, J. B. NELSON (*Jour. Expt. Med.*, 46 (1927), No. 4, pp. 541-548).—The author reports upon the spontaneous appearance of a second paratyphoid infection in a guinea pig population during the endemic stage of an earlier epidemic. A comparative study of the gross pathology of the two infections indicated a difference in the loci of development of the respective organisms in the animal host. The two types were readily differentiated by direct agglutination with specific immune

serums. From its agglutinative affinities the second organism was judged to be an *aertrycke* type of *Bacillus paratyphi*.

Paratyphoid (Salmonella) infection of calves in Kenya, R. DAUBNEY (Vet. Rec., 7 (1927), Nos. 38, pp. 793-802; 39, pp. 818-822).—The first part deals with symptoms of paratyphoid infection, lesions, diagnosis, post-mortem diagnosis, predisposing conditions, climatic conditions, bacteriology, and prevention. The second part is a discussion of the paper.

The possibility of human infection and intoxication by certain organisms of the Salmonella group.—I, Rate and extent of growth and physical changes produced in foods by *Bacillus suispestifer*, *B. pestis caviae*, *B. sanguinarium*, and *B. anatum*, S. R. DAMON and L. W. LEITER (Amer. Jour. Hyg., 7 (1927), Nos. 1, pp. 27-39; 2 p. 199).—In studies at the school of hygiene and public health, at Johns Hopkins University, the authors have found *B. suispestifer*, *B. pestis caviae*, *B. sanguinarium*, and *B. anatum* to multiply readily in all types of food except those which have a strong initial acidity. They grow readily in foods at body temperature and at room temperature, and growth is but slightly retarded at ice box temperature. The multiplication of these organisms in food under any conditions offers such slight evidence of infection as to be readily overlooked. It is pointed out that prevention of food poisoning by these organisms must therefore depend upon selection of raw products of unquestioned sanitary quality, care in the process of preparation so as to obviate contamination, and preservation under such conditions as will assure a minimum of growth in case the food has been contaminated.

Studies on the biology of streptococcus.—VII, Allergic reactions with strains from erysipelas, A. R. DOCHEZ and F. A. STEVENS (Jour. Expt. Med., 46 (1927), No. 3, pp. 487-495).—In the studies reported, rabbits immunized with filtrates of cultures of hemolytic streptococcus from erysipelas showed cutaneous allergy. Two periods of allergy were observed, an early and a late phase. It was found that the earliest reactions occurring in the first period of allergy could be neutralized with erysipelas immune sera.

Use of the precipitin test to determine the food supply of tsetse flies.—A preliminary note, W. B. JOHNSON and P. H. RAWSON (Roy. Soc. Trop. Med. and Hyg. Trans., 21 (1927), No. 2, pp. 135-149).—The subject is here discussed under the headings of preparation of antisera, preserving and storing antisera, technique of the test, and the test applied to blood found in tsetse flies. The test applied to blood found in tsetse flies is reported upon in detail in tabular form, as are data on nutrition of three species of tsetse flies, analysis of the blood found in them, analysis of the precipitin test applied to bloods of groups 1 and 3, etc.

The authors point out that the difficulties encountered in the preservation of blood and antisera without ice have hindered the development of the experiment, but that since the blood found in the flies can be preserved indefinitely when dried on filter paper strips, the precipitin test is likely to be of real value in determining the food of the fly. The antisera can be prepared and stored in a properly equipped laboratory, and the tests can be made there of bloods collected from the flies during field experiments.

On the pathology and therapy of sterility in the domestic animals with particular regard to physiology, W. FREI (Zur Pathologie und Therapie der Sterilität der Weiblichen Haustiere mit besonderer Berücksichtigung der Physiologie. Berlin: Richard Schoetz, 1927, pp. VI+196, figs. 20).—This is a monographic account of which the first part deals with fertility (pp. 1-17) and the main part with sterility, its physiology and pathology (pp. 18-196). A number

of bibliographical lists accompany the discussions of different phases of the subject.

The prevention of tuberculosis in animals, J. M'FADYEAN (*Vet. Rec.*, 7 (1927), No. 41, pp. 859-864).—This is an address delivered by the author in September, 1927.

A joint disease of cattle in the district East Coast of Sumatra [trans. title], F. C. KRANEVELD (*Dept. Landb., Nijv. en Handel Nederland. Indtē, Veeartsentjk. Meded.*, No. 59 (1927), pp. 20, pls. 6; *Eng. abs.*, p. 20).—An account of a joint disease etiologically related to the *Bacillus abortus* of Bang, or at least to a microorganism which can not be distinguished therefrom.

On the staining and morphology of the virus of contagious peripneumonia of cattle, II. HAZATO (*Tokyo Imp. Univ., Inst. Infect. Diseases Sci. Rpts.*, 5 (1926), pp. 49-53, pl. 1).—By the use of chromic acid as a prestaining measure, the author has been able to prevent the occurrence of granules and precipitates and obtain a clear, clean figure of the virus of bovine contagious peripneumonia cultivated in the serum broth media.

The diseases of cattle, E. WEBER (*Die Krankheiten des Rindes. Berlin: Richard Schoetz*, 1927, pp. [9]+375, pls. 3, figs. 52).—This is an epitome of the diseases of bovines, arranged by organs affected, each disease being considered systematically. A list of the more important literature is given with the account of each disease.

The treatment of liver fluke in sheep, H. R. SEDDON (*Aust. Vet. Jour.*, 3 (1927), No. 2, pp. 60-63).—Experiments with carbon tetrachloride, in which three distinct samples of the drug were used, show this chemical to be highly efficacious, leading to rapid destruction of the flukes, which even in a few days are expelled from the liver. It was found that a dose of 1 cc. is sufficient even for grown sheep, and that it is not necessary to prepare the sheep by previous starvation; they may be taken directly from the paddock and drenched. It may be administered either in capsules or as a drench. It is considered quite as efficacious as standardized extract of male fern, easier to prepare and administer, and less costly.

The control of tick infestation and a related disease of lambs in North Wales, C. L. WALTON (*Parasitology*, 19 (1927), No. 3, pp. 265-273).—The author here reports upon a serious infestation of sheep and lambs by *Ixodes ricinus* which took place in the uplands of Denbighshire, North Wales. The infestation observed was accompanied by a serious disturbance of health resulting in the general deterioration of the flock and the death of lambs.

Experimental dippings were commenced in 1924, using a special "short-interval" arsenical dip supplied by the Cooper Technical Bureau, London. Serial dippings were made each spring at five-day intervals, and when possible an early autumn series was conducted. The objects were (1) to control the infestation, (2) to control the diseased condition, and (3) to attempt to eradicate ticks from the land. The control of both the ticks and the disease was easily effected. A few sporadic cases of disease did occur during the course of the experiment. Eradication has not yet been accomplished, but the average number of ticks was reduced from 121 per animal in May, 1924, to 0.96 per animal in July, 1926. It is, therefore, suggested that short-interval dipping for serious tick infestation in sheep is practicable on British hill farms, and that the resultant mortality from disease can thereby be reduced.

Lamb dysentery (? *B. welchii* infection), T. DALLING (*Jour. Path. and Bact.*, 29 (1926), No. 3, p. 316).—This is an abstract of a paper dealing with a form of diarrhea known as lamb dysentery, which kills from 10 to 60 per cent

of the lambs born on certain infected farms in the counties on both sides of the Scottish border. A condition apparently identical with the natural disease has been produced by feeding a culture of *Bacillus welchii* or injecting it intravenously into very young lambs. The corresponding antitoxin is said to protect the lambs. By feeding the intestinal contents of severely affected lambs to healthy lambs and also by intravenous injection a similar condition has been produced. *B. welchii* antitoxin gave complete protection. A brief report is made on prevention through active immunization of ewes with *coli* vaccine plus *welchii* toxin-antitoxin mixture. Of 13,000 ewes inoculated either in the autumn or in the spring the mortality was 6 per cent and in the controls 12 per cent.

Lamb dysentery, T. DALLING (*Jour. Path. and Bact.*, 30 (1927), No. 3, pp. 567, 568).—During the 1927 lambing season a toxin-antitoxin mixture made from an organism of the *Bacillus welchii* type, as reported upon above, and also an antitoxin, were used with good results. Vaccine and serum prepared with this organism alone, without the *B. coli* type, gave as good results as those in which a combination of the two bacilli was used.

[Annual reports of the camel specialist, Sohawa, for the years 1924–25 and 1925–26], K. SINGH ([*Punjab*] *Camel Specialist Ann. Rpts. 1924–25*, pp. [6]+12; 1925–26, pp. [4]+13).—Reports of experimental work on the treatment of surra in equines by means of tartar emetic and Bayer 205, the incidence of this disease in privately owned animals, experimental transmission with flies and ticks, etc., are included.

Anemia in young pigs, L. P. DOYLE, F. P. MATHEWS, and R. A. WHITING (*Indiana Sta. Bul.* 313 (1927), pp. 18, figs. 14).—This is a report of studies of the pathology of anemia in young pigs, a knowledge of which it was thought would be very valuable in investigating the extraordinarily high death rate among young pigs. In three comparative experiments with 277 pigs, of which 146 were kept under inside conditions and 131 under outside conditions, anemia was found to be almost four times as prevalent and the death rate between the ages of 1 and 8 weeks nearly four times as high under inside conditions as under outside conditions. Pigs very rarely become anemic after 6 weeks of age, a spontaneous recovery usually commencing when the affected pigs were 6 to 7 weeks old. The death rate of the anemic pigs between 1 and 8 weeks of age was almost 20 times as high as the death rate of nonanemic pigs, and 89 per cent of the pigs which died were anemic. At 98 days of age, the nonanemic pigs averaged 15 lbs. more per head than the pigs which had been anemic. The occurrence of anemia did not appear to be appreciably influenced by the vitamins supplied in cod-liver oil, yeast, and orange juice. The addition of iron lactate to the ration did not prevent anemia in pigs kept under inside conditions.

During the studies here reported, anemia in pigs occurred as a striking pathologic manifestation. The conspicuous gross lesions were grayish-yellow mottling of the liver, ascites, and marked dilatation of the heart. Microscopically, the most prominent changes were marked degenerative fatty infiltration of the liver and the presence of hematopoietic centers in the liver, spleen, and bone.

Comparative values of types of anti-hog-cholera serum, D. I. SKIDMORE (*U. S. Dept. Agr. Circ.* 11 (1927), pp. 8, figs. 2).—In this paper the author describes the several types of anti-hog-cholera serum now on the market, the minimum doses permitted, etc. Three types of such serum are now available, namely, (1) defibrinated-blood serum, (2) clear, unconcentrated serum, and (3) clear, concentrated serum, the intrinsic values of which are dependent upon

the quality and quantity of true or protective serum present in each. Concentrated serum contains over 80 per cent of protective serum, while defibrinated blood serum and unconcentrated serum each contain 65 per cent of protective serum, and thus are only 80 per cent as valuable as the concentrated serum.

A parasitic fibroma on equines in Samoa, P. A. BUXTON (*Parasitology*, 19 (1927), No. 3, p. 352, pl. 1).—A brief description is given of the large tumors that occur on the pasterns and fetlocks, and occasionally between the eye and nostril, but never on other parts of the body of horses and donkeys in the Samoan Islands. These are thought to be of parasitic origin, pieces of a nematode having been occasionally seen in dissections made.

The use of diseased fowl in experimental investigations, L. D. BUSHNELL and W. R. HINSHAW (*Poultry Sci.*, 7 (1927), No. 1, pp. 17-22).—In this contribution from the Kansas Experiment Station data are presented to show the importance of eliminating reactors to the agglutination test for bacillary white diarrhea in conducting breeding and other research work with poultry.

The relationship of the epithelioma contagiosum virus of fowls to the vaccine virus, H. B. ANDERVONT (*Amer. Jour. Hyg.*, 6 (1926), No. 6, pp. 719-754, pls. 6).—The vaccine virus was found to be infective for the skin of the chicken, in which it produced lesions that were characteristic of a vaccinia infection, both macroscopically and microscopically, and were totally unlike the lesions produced by the epithelioma contagiosum virus in the fowl. The microscopic appearance of the chicken cornea inoculated with the vaccine virus was totally unlike that resulting from the application of the epithelioma contagiosum virus. Guarneri bodies appeared in the epithelial cells following infection with the vaccine virus and Bollinger bodies in infections with the epithelioma contagiosum virus.

The virus of epithelioma contagiosum was found to be mildly pathogenic for the rabbit, but it did not produce lesions resembling those of epithelioma contagiosum as seen in the chicken. Infection of the chicken with the virus of epithelioma contagiosum or of the vaccine virus was followed by a generalized immunity toward the respective virus. Infection of the rabbit with the vaccine virus was likewise followed by a generalized immunity toward the vaccine virus. Chickens which had been rendered immune to the epithelioma contagiosum virus remained susceptible to the vaccine virus, and vice versa. The serum of rabbits which had been recently rendered immune to the vaccine virus was found to possess virulicidal properties for that virus, but not for the epithelioma contagiosum virus. The serum of chickens which had been rendered immune to the epithelioma contagiosum virus was found to possess no virulicidal properties either toward the epithelioma contagiosum virus or toward the vaccine virus. No evidence of the presence of sessile antibodies was found in the comb tissue of chickens which had been rendered immune to the epithelioma contagiosum virus. The author's evidence does not support the view that the viruses of epithelioma contagiosum and of vaccinia are identical or even closely related.

A comparative study of the susceptibility of divers animals to vaccinia and to the diphthero-variola virus of the pigeon.—Immunity [trans. title], J. LAHAYE (*Ann. Méd. Vét.*, 72 (1927), No. 8-9, pp. 363-371).—The pigeon was found to be quite refractory to the vaccinia virus, and this virus did not produce any immunity to epithelioma contagiosa. The common fowl is more susceptible to the vaccinia virus, but no immunity to the virus of epithelioma is conferred. The virus of epithelioma from the pigeon, after its passage through the fowl, is not attenuated and will produce a typical form in the pigeon. Vaccinia does not confer any immunity in the bovine to bird pox, to

which it is susceptible. The rabbit appeared to be refractory to the virus of epithelioma. These studies have led to the conclusion that the vaccinia virus and that of epithelioma contagiosa constitute two entirely distinct entities.

Vaccination against avian diphtheria and fowl pox with the antidiphtherin of De Bleeck and Van Heelsbergen [trans. title], LEYNEN (*Ann. Méd. Vét.*, 72 (1927), No. 7, pp. 295-303).—This is an account by the director of the Veterinary Inspection Laboratory, who has found this method to give excellent results in Belgium.

Comparative investigations of *Bacterium paradysenteriae* (*Bacillus gallinarum* Klein, *Bacterium sanguinarium* Moore, *Bacillus typhi gallinarum* alcalifaciens Pfeiffer) [trans. title], GRESSEL (*Deut. Tierärztl. Wchnschr.*, 35 (1927), No. 17, pp. 267-275, figs. 2).—In reviewing the history of fowl typhoid it is pointed out that the first record of its occurrence in Germany was that of Pfeiffer and Rehse from the Province of West Prussia in 1912 (*E. S. R.*, 30, p. 335). The literature is reviewed in connection with a list of 34 references, followed by a report of a study of its morphology and staining, culture on various media, and of the agglutination test.

An epidemic of fowl typhoid, S. MILLER and F. B. SMITH (*Jour. Path. and Bact.*, 30 (1927), No. 1, pp. 178, 179).—The authors report upon studies made in a flock of 39 birds at Harrogate during the course of an epidemic among poultry in the upper district of Nidderdale in Yorkshire in 1926. Twenty-two birds in the flock were affected in small groups at 6- to 8-day intervals, and all succumbed to the disease. Early in the epidemic the birds were observed to be affected and to succumb within 12 to 24 hours, but toward the end of the epidemic the illness lasted from 2 to 3 days. General dullness and loss of appetite were the main symptoms, with marked diarrhea and sulfur-yellow stools shortly before death. All of the old birds of the flock escaped infection, the cases occurring in those 1 year of age or less. *Salmonella gallinarum* was obtained in pure aerobic cultures from the liver, spleen, and bone marrow of each of four bodies examined.

On fowl typhoid in Rumania: Its practical diagnosis by the intradermal reaction [trans. title], [C.] CERNAIANU (*Rev. Vét. [Toulouse]*, 79 (1927), [No. 7], pp. 396, 397; *Eng. trans. in Vet. Rec.*, 7 (1927), No. 39, p. 826).—The occurrence of fowl typhoid in Rumania was first recognized in 1925 (*E. S. R.*, 57, p. 473). In clinical appearance it is the same as in France, although it occurs in a more virulent form, and this is thought by the author to be responsible for his failure in the preparation of a protective serum. The English translation is by R. L. Higgins.

AGRICULTURAL ENGINEERING

Influence of drainage on the physical properties and mechanical structure of soil [trans. title], R. JANOTA ([Czechoslovakia] *Min. Zeměděl., Sborn. Výzkumn. Úst. Zeměděl.* No. 16 (1925), pp. 142, figs. 30; *Fr. abs.*, pp. 129-133, *Ger. abs.*, pp. 134-138).—Studies of the effect of tile drainage on the physical and mechanical properties of slightly podsolized brown soils and heavy soils with marl subsoils are reported. Ninety soil profiles were studied to a depth of 1 meter under drain spacings of from 1 to 3 meters.

The structure of the soil type was found to be a function of the movement of water through the soil. The downward movement of drainage water causes the concentration of the finer soil particles and soluble electrolytes in the subsoil. The difference between the contents of fine particles in surface and subsoils was found to be 10 per cent in loam soils and 20 per cent in heavy soils. Thus natural drainage may account, in large measure, for the high

content of cementing materials and the low porosity and poor ventilation of subsoils.

Artificial drainage was found to remove excess water from soil and by improved ventilation to cause the stabilization of colloidal material in the top layers. In artificially drained soils the contents of fine particles and carbonates in the surface soil were found to increase from the drain to the middle point between drains. At the same time the porosity decreases with increasing spacing of drains. In the subsoil the content of fine particles and carbonates is the greatest with the lowest porosity, and the former decrease from the drains to the middle point between drains while the porosity increases. Thus the subsoil presents the poorest structure under drainage, especially in heavy soils.

Artificial drainage causes rapid changes in the physical properties of surface soils. This effect decreases with depth until in the subsoils these changes almost disappear, especially in heavy soil types.

The production and maintenance of a crumb structure were more difficult in heavy soils than in loam soils under drainage, and liming may be resorted to after drainage to aid this situation.

Public Roads, [October, 1927] (*U. S. Dept. Agr., Public Roads, 8 (1927), No. 8, pp. 159-190*+[2], *figs. 56*).—This number of this periodical contains statistical data on motor vehicle registrations for the first six months of 1927 and the status of Federal-aid highway construction as of September 30, 1927, together with the following articles: Tests of the Delaware River Bridge Floor Slabs, by G. W. Davis (pp. 159-178, 189); and Further Tests of Vibrolithic Concrete, by L. W. Teller and C. E. Proudley (pp. 179-189).

New methods of dry land cultivation, M. DE ARANA Y FRANCO (*Nuevos Métodos de Cultivo en Secano. [Madrid]: Ramona Velasco, [1925], pp. 295, figs. 122*).—Methods and machinery used in dry land farming in Spain are described and discussed in considerable detail. Apparently the machinery used is practically the same as that used in American dry farming.

Investigation of a basis for the working surface of the plow [trans. title], H. VON SYBEL (*Landw. Jahrb., 66 (1927), No. 1, pp. 1-54, figs. 10*).—In a contribution from the Berlin Technical Academy an extensive theoretical consideration of the plow and its purpose is given. An analysis of the main mechanical properties of cultivated soils leads to the conclusion that a theoretical derivation of plow moldboard forms is untenable. The shaping of the working surface is therefore discussed on the basis of the conception of the plowing process as a matter of the valuation of cutting edges. Three basic plow forms are thus derived.

The combine harvester on Oklahoma farms, 1926, J. O. ELLSWORTH and R. W. BAIRD (*Oklahoma Sta. Bul. 162 (1927), pp. 15*).—The results of a study conducted in cooperation with the U. S. Department of Agriculture and the Texas, Kansas, Nebraska, and Montana Stations are reported, including data on cost of operation, purchase price, labor, power, fuel, grain losses, equipment, repairs, and the use of the combine for grain sorghum.

The 15-ft. combines were found to operate at an average cost of \$2.09 per acre, the 7-ft. binders at \$4.40, and the 12-ft. headers at \$3.44 per acre. Costs per bushel for the entire group of States averaged 14 cts. with the combines, 23 cts. with the header, and 29 cts. with the binder.

The combine crew ranged from 1 man with the 8-ft. machines to 3 men with the 20-ft. machines. The 20-ft. combines had the lowest fuel consumption per acre and the 12-ft. machines the highest. The grain losses in the head only were 2.6 per cent for combines, 3.3 per cent for headers, and 6.1 per cent for

binders. The grain tank was found to be economical when the threshed grain was hauled in trucks.

The costs for harvesting sorghum were 4.2 cts. per bushel with the combine, 5.2 cts. with the header, 17.5 cts. with the row binder, and 11.2 cts. with the hand-topping method.

Power requirements of electrically driven dairy manufacturing equipment. A. W. FARRALL (*California Sta. Bul.* 433 (1927), pp. 20, figs. 8).—It was found that the electric energy consumed by dairy manufacturing equipment may be determined by the use of suitable instruments, and that the cost of energy used in the processing of dairy products may be accurately calculated. The power requirements and energy consumption of a machine are largely affected by conditions under the control of the operator, and careful selection of the proper size and type of equipment is important if the best results are to be secured.

In the operation of a refrigeration machine of medium size under normal conditions, a saving of 16 per cent in the cost of power may be expected when the head pressure is maintained at 150 lbs. instead of 200 lbs. per square inch. The proper balancing of such equipment as churns was found to reduce strains in the motor and driving mechanism and to result in more economical operation.

No definite size of motor could be recommended for all types of ice cream freezers, as a large variation in power consumption was found with the different types as well as with various methods of freezing and kinds of ice cream manufactured. The stiffness to which ice cream is frozen should be closely controlled in order to prevent overloads upon the motor and driving mechanism, to reduce the cost of operation, and to secure uniformity in the product.

It was found that the relationship between the power consumption of the freezer motor and the stage of the freezing process is very close with many types of freezers. It differs in individual machines and is affected somewhat by variations in kind, age, and ingredients of mix and the brine temperature.

Electrically heated dairy sterilizers were found to be practical and economical if properly designed and operated, and should be safe to operate when a small amount of water is used. For best results the sterilizer should be insulated with a double-walled air space and equipped with a reliable thermostat or time switch.

The German farm machinery industry, its development, and its present status. R. AHEENS (*Die Deutsche Landmaschinenindustrie, Ihre Entwicklung und Ihre Heutige Lage.* Greifswald: L. Bamberg, 1926, pp. 174, fig. 1).—This report presents a large amount of data on the origin of the German farm machinery industry and on its development during the periods previous to and since 1914. An extensive bibliography of literature bearing on the subject is appended.

RURAL ECONOMICS AND SOCIOLOGY

[Report of the committee on farm economics and accounting], H. M. CONACHER ET AL. (*Edinburgh: Govt.*, 1926, pp. 34).—This is the report of the committee appointed in February, 1925, by the Board of Agriculture for Scotland to examine and report on methods of farm accounting followed in different countries; to recommend the method which seems best for ascertaining the cost of production and profit; and to indicate the principal problems of farm economics, the solution of which might be aided by the collected results of a sufficient number of kept accounts, and whether the board might profitably collect further statistical information.

The problem of securing closer relationship between agricultural development and irrigation construction, D. WEEKS and C. H. WEST (*California Sta. Bul.* 435 (1927), pp. 99, figs. 24).—In 1924 irrigation projects in California were equipped to irrigate 6,700,000 acres and approximately 1,000,000 additional acres of irrigable land were included in projects. Of the 6,700,000 acres, about 18 per cent was irrigable but not irrigated, and about 11 per cent was not making good use of water. Based upon the rate of settlement during the past 5 years, 15 to 20 years will be required to develop the land for which construction has already been provided.

The bulletin includes a general statement of the important characteristics of irrigation development in California, with an analysis of the degree to which irrigation works have been constructed and utilized, and an analysis of the chief factors affecting the lag of agricultural development behind irrigation construction.

The relation of business conditions to construction and settlement and the factors urging irrigation construction and affecting the rate of land settlement are discussed. Lack of knowledge regarding costs of land development and the amount of capital needed to undertake the development of land have been among the principal causes of delay in settlement. The price of raw unimproved land, the cost of irrigation construction, taxes paid before land is irrigated, the cost of improving lands, and interest costs during the development period are analyzed. Statements are included of costs and investment by years for orchards and farms of different types and sizes.

The bulletin was prepared in cooperation with the Federal Land Bank of Berkeley.

The farm real estate situation, 1926-27, E. H. WIECKING (*U. S. Dept. Agr. Circ.* 15 (1927), pp. 42, figs. 13).—Tables, graphs, and maps are given and discussed showing (1) by States and geographic divisions the changes in farm real estate values during the year 1926-27 with comparisons with previous years; (2) by States the percentage of change in the aggregate value and the value per acre of farm real estate from 1920 to 1925 and from 1910 to 1925; (3) by counties the percentage of change in the value per acre of farm real estate from 1920 to 1925 and the value per acre January 1, 1925; (4) by States and geographic divisions the percentage of change from 1920 to 1925 in the aggregate value and per acre value of farm buildings and of farm land, exclusive of buildings; (5) by States and geographic divisions the number of farms per 1,000 changing ownership by various methods during the years ended March 15, 1926 and 1927; and (6) the relative changes in taxes on farm real estate by geographic divisions in 1924, 1925, and 1926, and in Michigan, Colorado, and New York for periods of varying lengths. Farm credit is also discussed briefly.

The decline in farm real estate values during the year 1926-27 averaged 4 per cent for the United States, bringing the total decline from the 1920 peak to about 30 per cent. From 1920 to 1925 the value per acre of farm lands, including buildings, declined 22.9 per cent, but the value per acre of buildings increased 5.7 per cent. During the year ended March 15, 1927, voluntary sales of farms decreased from 29.6 to 28.3 per 1,000 sales, and forced sales increased from 21.4 to 22.8 per cent per 1,000. Using 1924 as equal to 100 per cent, taxes on farm real estate in the United States increased from 100.2 in 1925 to 101.5 in 1926. The averages for all the geographic divisions increased, except the West South Central division, which declined 1 per cent. In the New England and South Atlantic divisions the increases were 4.7 and 7.1 per cent, respectively.

Cotton and the cotton market, W. H. HUBBARD (*New York and London: D. Appleton & Co., 1927, 2. ed., pp. XII+503*).—This is the second edition of the book previously noted (*E. S. R.*, 51, p. 192).

Some economic problems involved in the pooling of fruit, H. E. ERDMAN and H. R. WELLMAN (*California Sta. Bul. 432 (1927), pp. 46, figs. 2*).—The advantages and disadvantages of handling the products of cooperative fruit-marketing associations on a pooling basis, the basis for pooling, the problems of the maintenance of a proper differential between members of a pool, the equitable distribution of the risks of marketing and the prorating of costs and expenses between pools, the relation of the pooling plan to orderly marketing, the costs of marketing, and the methods of making payments to members are described and discussed.

Carlot distribution of Washington apples, G. H. FREDDELL (*Washington Col. Sta. Bul. 218 (1927), pp. 31, figs. 2*).—The shipping records for 1923-24, 1924-25, and 1925-26 of apple shippers and shipping agencies in all of the principal producing sections of Washington were studied to ascertain the points to which carload lots of apples were being billed. The shipments included in the study were 54.3, 56.9, and 60.1 per cent, respectively, of the total shipments from the sections studied. A table is included showing for each year the number of straight carload shipments billed to different points in the United States and foreign countries.

Some economic aspects of the marketing of milk and cream in New England, W. A. SCHOENFELD (*U. S. Dept. Agr. Circ. 16 (1927), pp. 74, figs. 33*).—This bulletin presents data collected in a study undertaken for the purpose of obtaining and analyzing the economic facts surrounding the production and marketing of milk and cream in New England, with a view to developing a plan for cooperative marketing and a better productive program for the section. The production of, the markets for, and the movement of milk and cream, the probable effect of recent freight rate changes, and the potentialities of tank-car shipments are described. The possibilities for consolidation of shipping plants, the economical size for country milk stations, the differential between retail-delivered and store milk, the relation of retail prices to consumption, the influence of producer prices upon production, the relation of basic economic factors to milk-price policies, and the different plans for producer control of production and price are discussed.

With the usual densities of production and seasonal variations, the minimum per unit cost of operation, including hauling to the plants and transportation to market, was reached with plants handling an annual volume of about 10,000,000 lbs. Changes in retail prices of fluid milk were found to have little effect on consumption, but changes in milk prices to producers relative to feed costs had a marked effect on production, the effect reaching its maximum in 6 to 18 months after the price change.

Appendixes include suggested plans and equipment for country milk stations, freight rates and miscellaneous tables, and a selected bibliography on marketing fluid milk.

Cattle marketing investigations at Portland, Oregon, H. A. LINDGREN and E. L. POTTER (*Oregon Sta. Bul. 229 (1927), pp. 16, figs. 9*).—This bulletin presents the results of a study to determine the type of cattle best suited to meet the needs of the consumer and at the same time increase the present profits of the producer. The Portland market was visited 16 times between January 4, 1926, and April 18, 1927. The 40,193 head of cattle received during the period were classified as in desirable condition, too thin, too young, of dairy breeding, or of scrub breeding, and the prices received for the various grades were obtained. The study led to the following conclusions:

All beef-bred steers should be made as fat as possible on grass or hay, especially for the early summer market. There is no advantage in crowding unfinished cattle into the higher price, late-spring market. The average premium of 35 cts. for 100 lbs. on grain-fed over hay-fed steers does not justify grain feeding. Young steers, if fat, bring a satisfactory price, and 950 to 1,150 lb. steers are most desired. Heifers sell to better advantage than thin or low-grade steers. Beef-bred cows should be made as fat as possible on grass. Discarded dairy cows should be sold as soon as possible. Calves should be marketed before passing 200 lbs. in weight. The Portland market was found to demand an average of 2,500 head of cattle per week.

Crops and Markets, [October, 1927] (*U. S. Dept. Agr., Crops and Markets, 4* (1927), No. 10, pp. 369-408, figs. 4).—Tables, notes, graphs, and summaries of the usual types are included covering crops, livestock, agricultural products, prices, and other matters pertaining to agriculture.

How Minnesota farm family incomes are spent, C. C. ZIMMERMAN and J. D. BLACK (*Minnesota Sta. Bul. 234* (1927), pp. 49, figs. 4).—This bulletin is an interpretation of a one year's study made in 1924-25. Data on receipts, expenditures, and living conditions were gathered by personal visits to 357 families in 7 typical communities in 7 counties of the State, from 44 to 61 families being interviewed in each community. Information was obtained only regarding living expenses for 200 of the families, and data as to cash receipts and farm expenditures, as well as living expenses, were obtained from the other 157 families.

The average cash receipts in the different communities varied from \$1,355 to \$3,964, averaging \$2,802, and the average cash expenditure from \$1,675 to \$3,984, averaging \$2,882. The expenditures of 56 families exceeded the amount of receipts. The expenditures were distributed into 4 main groups. The averages by communities varied as follows: Farming from \$545 to \$1,619, averaging \$1,066; living from \$724 to \$1,517, averaging \$1,025; investments from \$163 to \$889, averaging \$579; and automobiles from \$116 to \$345, averaging \$212.

Tables with explanatory text are given showing the size of farms, tenure, nationality of operators, and types of farming in the different communities studied, and by communities the average cash receipts and expenditures, the expenditures by main groups and for different items of such groups, and the consumption of different kinds of food per family or per adult equivalent. Some tables making comparisons by cash receipts groups and some pertaining to age of marriage, size of families, attitude toward education and extension work, and taxes are included.

The rural health facilities of Ross County, Ohio, C. E. LIVELY and P. G. BECK (*Ohio Sta. Bul. 412* (1927), pp. 54, fig. 1).—This bulletin presents the results of a study made (1) to determine the existence, nature, and location of the rural medical and health facilities in a typical Ohio county and to set forth the conditions of their use, and (2) to discover the extent of the use of these facilities by the country people and the factors making for variations in such use. The data were obtained by personal visits to all health agencies serving the rural parts of the county, and by visits to 50 families in each of four representative sections of the county to obtain data relative to the use of these agencies during the year preceding the survey.

The 200 families studied averaged \$39.29 per family spent during the year for medical and health purposes, of which \$7.31 was for unprescribed drugs and remedies and \$31.98 for professional services, of which 64.3, 17.6, 6.6, 5.9, and 5 per cent, respectively, went for physicians, dental, nursing, hospital, and optical services. Of the 884 persons visited, 378 were ill during the year, of

whom 72 per cent received care from medical or other health agencies. The use made of health agencies by different families was found to vary largely according to health standards, economic standing, distance to agencies, sex, age, and size of family.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, and outline of functions of major branches of the Department, 1927 (*U. S. Dept. Agr., Misc. Pub. 5* (1927), pp. X+100).—The technical workers in Washington and the field service are listed by bureau divisions, and an index of names is given. A brief outline of the principal functions of the major branches of the Department is included.

History of agriculture in Colorado, A. T. STEINEL and D. W. WORKING (*Fort Collins: Colo. Agr. Col., 1926, pp. 659, figs. 114*).—This is "a chronological record of progress in the development of general farming, livestock production, and agricultural education and investigation on the western border of the Great Plains and in the mountains of Colorado, 1858 to 1926," and is published by the Colorado State Agricultural College in honor of the fiftieth anniversary of the admission of Colorado to the Union. A chapter (pp. 583-647) is included on agricultural education.

[**Agricultural research and education in rural economy**] (*[Gt. Brit.] Delvmt. Comms. Rpts., 15* (1924-25), pp. 26-137; *16* (1925-26), pp. 14-113).—These reports for the years ended March 31, 1925 and 1926, of the expenditures for agriculture and rural economy under the development and Road Improvement Funds Acts, 1909 and 1910, are of the series previously noted (*E. S. R., 53, p. 298*).

The grants in connection with the agricultural industry are for the maintenance of research institutes and experimental stations; maintenance of an advisory service associated with university departments of agriculture or agricultural colleges; special grants to individual research workers; fellowships for members of the research and advisory staffs and scholarships for training graduates in research methods; aid to colleges for buildings and equipment or for extension work, to farmers' institutes, and to classes provided by local education authorities; and grants for other schemes put forward by the departments of agriculture or by other approved agencies for furthering knowledge in agricultural science or practice. The advances devoted to enlarging the amenities and opportunities of village life generally are confined to the purposes of organization, advice, and propaganda, and usually are granted on approved schemes to suitable voluntary agencies, such as women's institutes, village club associations, or community councils.

A review of five years of fact organization and State and regional program making in the Western States, and a report of the 1927 extension conference, W. A. LLOYD (*U. S. Dept. Agr., Misc. Pub. 8* (1927), pp. 19, figs. 6).—A brief description is given of the State, county, and regional fact organization conferences held in a number of Western States and of the results of such conferences. The reports of the committees on clothing and poultry, the subjects considered at the fourth regional program-making conference held at Reno, Nev., July 11-14, 1927, are included.

"How to make and save money on the farm," G. W. CARVER (*Alabama Tuskegee Sta. Bul. 39* (1927), pp. 16).—A popular bulletin giving information on canning, drying, and preserving vegetables and fruits, making compost, controlling the boll weevil, and other means of increasing farm returns and reducing cash expenditures.

Teaching farm shop work and farm mechanics, G. A. SCHMIDT, W. A. ROSS, and M. A. SHARP (*New York and London: Century Co., 1927, pp. XXVII+288, pls. 31, figs. 11*).—This book is intended to meet the needs of men preparing to teach vocational agriculture, and especially those teaching or preparing to teach farm shop work and the other forms of farm mechanics. The problems and procedure for determining what to teach in farm mechanics courses are described. The means and methods of organizing the teaching content and such problems as making teaching plans and job outlines of enterprises and analyzing jobs are discussed and illustrated. The methods and devices to assist the pupils in acquiring knowledge, skills, attitudes, ideals, and appreciation are considered. Emphasis is put upon the project method in teaching farm shop work. Other chapters discuss teaching materials, the school farm mechanics shop and its equipment, the home farm shop, farm mechanics for part-time and evening classes, and farm mechanics records and contests. A list of references is given for each chapter.

Appendixes include lists of books, manuals, bulletins, periodicals, etc., pertaining to farm mechanics, of tools and equipment for school and home shops, of illustrative and other material of interest to farm mechanics teachers, and of publications of the U. S. Federal Board for Vocational Education pertaining to vocational agriculture and farm mechanics. The report of the American Vocational Association committee on the preparation of farm shop teachers is also included.

Technical writing of farm and home, F. W. BECKMAN, H. R. O'BRIEN, and B. CONVERSE (*Ames, Iowa: Journalism Pub. Co., 1927, pp. X+417*).—This volume is prepared for use as a textbook for college instruction in agricultural and other technical phases of journalism and as a guide to persons who must prepare articles but who have had little training in the technique of writing.

FOODS—HUMAN NUTRITION

Investigations on the use of fruits in ice cream and ices, G. D. TURNBOW and W. V. CRUESS (*California Sta. Bul. 434 (1927), pp. 38, figs. 4*).—Standardized methods are given for the use of fruit products in the manufacture of ice cream, water ices, and frozen specialties. Although based on large scale production, some of the methods are adaptable to home preparation.

The fresh fruits studied included apricot, avocado, banana, cherry, fig, peach, pear, orange, persimmon, and various berries. Larger proportions of the fresh fruit than the California legal minimum of 3 per cent are recommended. The fruit should be thoroughly ripe and ground fine to prevent the formation of hard pieces on freezing. Among the fruits not heretofore used commercially for ice cream, fig, persimmon, and avocado gave very good results. Fruits preserved by the cold-pack process described by Cruess (*E. S. R., 54, p. 789*) gave good results when thawed before being incorporated with the mix.

A comparison of various grades of commercially canned fruits showed that the lowest and cheapest grade, the solid pack pie grade, is the most satisfactory for use in ice creams and ices. Particularly good results were obtained with canned figs. Preserves and jams were not very satisfactory on account of their sweetness and high cost. Of dried fruits, prunes and Muscat raisins are recommended as most satisfactory, particularly the former.

Formulas for fruit water ices include the use of fresh apricots, berries, grapes, lemons, oranges, peaches, plums, and pomegranates. Bottled juices of some of these fruits gave good results, but in general concentrates and sirups were not satisfactory.

Formulas are given for the use of fruits in various frozen specialties, including frozen plum pudding, Nesselrode pudding, tutti-frutti ice cream, lacto (the foundation of which is skim or whole milk soured with lactic acid culture), and frozen fruit punch.

Kadota fig products, W. V. CRUESS (*California Sta. Bul.* 436 (1927), pp. 43-45).—Brief directions are given for canning, preserving, candying, and glacéing Kadota figs, the production of which in California is noted on page 237.

The Jerusalem artichoke, L. E. DUNTON (*Forecast*, 34 (1927), No. 5, pp. 295, 296, 332, figs. 3).—The average values obtained in analyses of 12 samples of Mammoth White French Jerusalem artichoke grown at the Kansas State Agricultural College are given as moisture 81.2, total ash 1.263, phosphorus 0.0992, calcium 0.0227, and iron 0.0034 per cent. Attention is called to the relatively high content of phosphorus and iron as compared with other root vegetables and the relatively low content of calcium. This would make a combination of artichokes with milk desirable for furnishing bone-building material. The fact that the carbohydrate of the artichoke is chiefly inulin, which is probably not available to the human organism, suggests the desirability of the use of artichokes in diets for diabetes and obesity. Tested recipes for preparing artichokes for the table are included.

The manganese content of plant and animal materials, C. W. LINDOW and W. H. PETERSON (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 169-175).—Data are given on the manganese content of 84 samples of representative food materials such as fruits, vegetables, cereals, nuts, meat, fish, and shellfish. The determinations were made by the Official periodate method on samples cut in small pieces and dried in the air and finally to constant weight at 100° C. Preliminary tests were made to determine the size of sample necessary to produce a satisfactory depth of color. The analyses were always made in duplicate, and sometimes in addition a recovery test was made with added potassium permanganate.

The reported values varied from 0 in fish to 0.02162 per cent on the dry basis in northern grown lettuce. The average percentages for some of the principal types of foods were for 7 animal tissues 0.00062, 11 bush and vine foods 0.00178, 10 roots and tubers 0.00184, 4 nuts 0.00186, 4 leguminous seeds 0.00200, 5 cereals 0.00268, and 12 leafy vegetables 0.00670. Variations in the same type of material were widest in tree fruits, berries, roots, tubers, and leafy materials. Northern grown lettuce contained twice as much manganese as southern grown lettuce, and in 22 samples of cabbage the manganese ranged from 0.00052 to 0.00159 per cent.

A list of 30 references to the literature is appended.

A comparison of evaporated with pasteurized milk as a source of calcium, phosphorus, and nitrogen, A. C. WILLARD and K. BLUNT (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 251-262).—This study was undertaken to secure data in regard to the comparative value of evaporated and pasteurized milk as sources of calcium, phosphorus, and nitrogen in the diet of children and adults. Two girls (8 and 12 years of age), two boys (3 and 4 years of age), and three adults served as subjects. A simple diet which included evaporated milk diluted with an equal amount of water was given for 6 or 7 days, following which the same diet was given with pasteurized milk in place of evaporated. In a second series of experiments the order was reversed. Calcium, phosphorus, and nitrogen balances were determined in both periods. For the older children, receiving 825 gm. of milk daily, 90 per cent of the calcium, 65 per cent of the phosphorus, and 40 per cent of the nitrogen came from the milk. For the younger children, receiving 810 gm. of milk, the corresponding figures were 95, 78, and 58 per cent. The adults received only 133 gm.

of milk daily in order to keep the calcium at the minimum amount for equilibrium. This furnished 50 per cent of the calcium, 20 of the phosphorus, and 10 of the nitrogen.

The calcium intake for each of the children was more than 1 gm. daily and the retention from 0.11 to 0.64 gm., or from 0.007 to 0.028 gm. per kilogram of body weight. Three of the children retained more calcium from the evaporated than the pasteurized milk and the other child slightly more from the pasteurized. The phosphorus intake was approximately 1 gm. a day for each of the children, and without exception, both by actual weight and percentage of intake, the retention was higher on the evaporated milk, ranging from 0.068 to 0.187 gm. per day. The average protein intake was over 2 gm. per kilogram. Three of the children showed a higher nitrogen retention on the evaporated milk and one practically no difference.

In the work with adults, the calcium balances alone are thought to be of significance. Of these, half were in favor of the evaporated and half the pasteurized milk. The difference in favor of the evaporated milk in 10 out of 12 balances reported for the children is thought to make justifiable the conclusion that evaporated milk is at least as good a source of calcium, phosphorus, and nitrogen for the growing child as pasteurized milk and possibly better. For adults evaporated milk appears to be as good a source of calcium as pasteurized milk.

Coffee and milk drinking habits of school children, J. C. FETTERMAN, M. L. C. SHILLINGER, and R. R. IRVIN (*Nation's Health*, 9 (1927), No. 8, pp. 31-33, 72, figs. 8).—Information was obtained in this survey of the extent of coffee drinking among 80,070 elementary and high school children from public and parochial schools in Pittsburgh and Allegheny County, Pa., on the distribution of coffee and milk drinking according to meals, the relationship of milk and coffee drinking to class standing, changing milk and coffee habits of children as they progress through school, and the average consumption of milk and coffee by different groups and social classes. Of the total number of children included in the survey, 74,356 were in elementary grades and 5,714 in the kindergarten, high school, or special grades.

The parochial children throughout the elementary grades drank more coffee and less milk than the public school children. During the first two years in school there was an increased consumption of milk by the public school children, followed by a decline in the third year. The parochial school children on the other hand drank less and less milk from the kindergarten on. Although both groups drank more coffee as they progressed through school, the rate of increase was greater in the parochial than the public school children. These differences are thought to point to more active instruction during the first grades of the public school on milk versus coffee drinking. The average consumption of milk by the elementary school children ranged from 0.89 glass daily for the county parochial school child to 1.58 glasses for the county public school child and that of coffee from 0.72 cup for the public school child to 1.52 cups daily for the city parochial school child.

Graded in class standing as good, fair, and poor, the number of good pupils was greatest among those drinking only milk and the number of fair pupils among those drinking only coffee. Grouped by social classes, 4,881 children from eight public schools in the better districts of the city averaged 2.13 glasses of milk and 0.31 cup of coffee daily and 5,825 from the poorer sections of the city 1.19 glasses of milk and 1.1 cups of coffee daily. More children in each of the groups drank milk at lunch than at the other two meals and more drank coffee at breakfast than at the other meals.

Gelatin added to diets of artificially fed infants, J. H. HESS and I. MCK. CHAMBERLAIN (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 17, pp. 1423-1426, figs. 7).—The feeding studies reported were carried out on a group of 34 normal artificially fed infants at the University of Illinois Educational and Research Hospital Dispensary and at three infant welfare stations conducted by the health department of Chicago. All feedings were made with fresh cow's milk, approximately 2 oz. per pound of body weight per day, boiled water to make the total fluid intake 2.5 to 3 oz. per pound, and granulated sugar in amounts approximating 0.1 oz. per pound of body weight. The mixtures were boiled 3 minutes and given in 5 or 6 feedings daily. Cod-liver oil and orange juice were given daily, the latter in amounts of 1 oz. for each 16 oz. of milk. After a preliminary period of adjustment to the formula, one of two additions to the milk was made: (1) Gelatin in amounts of 1 per cent of the milk of the mixture and (2) raw egg yolk in amounts equivalent in calorie value to the gelatin. The orange juice was fed separately from the gelatin milk, but mixed with the egg yolk in the other diet. Three of the infants received the gelatin-milk mixture throughout the experimental period of from 11 to 16 weeks, 3 the egg yolk-milk mixture throughout the entire period, and 28 the two diets in alternating periods of 3 or 4 weeks each.

There was a total of 154 weeks of feeding the gelatin-milk mixture, with an average gain of 6.44 oz. a week, and a total of 151 weeks on the egg yolk-milk mixture, with an average gain of 6.46 oz. The average gain of the controls on the gelatin-milk mixture was 5.82 oz. and on the egg yolk-milk mixture 6.75 oz. a week. The 3 subjects on the gelatin-milk mixture showed losses in hemoglobin of 4, 8, and 13 per cent, respectively. One on the egg yolk-milk mixture showed no change and the other two gains of 17 and 7 per cent, respectively. On the gelatin-milk mixture the stools were rather foul-smelling and were passed with difficulty, while those on the egg yolk-milk mixture were of more normal color and consistency.

Although the authors draw no conclusions concerning the relative merits of the two types of feeding, these results would seem to be in favor of the egg yolk-milk mixture.

Investigations of dental caries, P. R. HOWE (*Jour. Amer. Dental Assoc.*, 14 (1927), No. 10, pp. 1864-1866).—This paper, presented at the Seventh International Dental Congress at Philadelphia, Pa., August 25, 1926, deals with the effects of faulty nutrition on tooth development and preservation as determined by animal experimentation in the author's laboratory (E. S. R., 54, p. 204) and elsewhere. The observations regarded as most significant are "that the most rapid and pronounced caries in monkeys has occurred when the diet has been largely composed of gelatin and cereals; that a deficiency of the antiscorbutic factor has played a part in the production of caries; that excess of sugars and starches has not resulted in caries within the allotted time of the experiment, or nine months; that monkeys fed a milk, vegetable, and fruit diet have excellent teeth."

Talks to nurses on dietetics and dietotherapy, R. and H. WHEELER (*Philadelphia and London: W. B. Saunders Co.*, 1926, pp. 184).—A series of informal lectures to nurses on the general principles of dietetics and the dietary treatment of special conditions and diseases, with emphasis on diseases of the digestive system and metabolic disturbances.

Handbook for menu planning, D. K. GATCHELL and C. C. HELBING (*Atlanta, Ga.: Smith, Hammond & Co.*, 1927, pp. IX+154).—This handbook differs from the usual type of cookery manuals in that instead of furnishing a collection of menus for various purposes it deals with types of foods and food combina-

tions from which selection can be made for a wide variety of menus fulfilling definite principles. The method of using the handbook is outlined as follows:

"Select the type of meal most appropriate to the occasion for which your menu is being planned. Choose types of foods in keeping with the size, occupation, likes, and dislikes of the family or guests. Select combinations of foods that match or blend in flavor, color, texture, and temperature. Check your combinations for nutritive values in respect to calories, proteins, ash constituents, vitamins A, B, C, and D. Compare the costs of your menus in respect to nutritive needs of the family, the family income, and the food allowance. Study the methods of cooking each dish, taking into account the facilities for its preparation and the appropriate recipes to use. Check your menu to see if the foods selected are in season, accessible at local markets, and liked in your region or locality. Plan meals for a week or month in order to secure variety of foods and work in leftovers."

A good diet and a bad one: An experimental contrast, R. McCARRISON (*Brit. Med. Jour.*, No. 3433 (1926), pp. 730-732, fig. 1).—An abstract of a paper noted previously (*E. S. R.*, 57, p. 889).

The toxic action of cystine on the kidney, A. C. CURTIS, L. H. NEWBURGH, and F. H. THOMAS (*Arch. Int. Med.*, 39 (1927), No. 6, pp. 817-827, figs. 2).—By feeding rats various amounts of cystine as a supplement to low and high casein diets (8 and 18 per cent) and observing the effect of such diets on growth and on the kidneys, the authors have concluded that cystine in the diet becomes harmful when it is 2.5 or 10 times the requirement, depending upon whether the preformed cystine in the basic diet is determined by biological analysis, as developed by Sherman and Woods (*E. S. R.*, 55, p. 791), or by chemical analysis. The addition of 0.5 per cent of cystine to an 18 per cent casein diet is mildly harmful. As the level of cystine in the diet is raised the evidence of renal injury increases. Levels ranging around 1.5 per cent of cystine produce necrosis in the renal tubules within a year, 4 per cent interferes with the growth of young animals, as well as producing renal injury, and 5 per cent causes death in several weeks and 10 per cent in a few days.

The toxic action of cystine on the liver of the albino rat, A. C. CURTIS and L. H. NEWBURGH (*Arch. Int. Med.*, 39 (1927), No. 6, pp. 828-832, figs. 5).—In addition to the injury to the kidneys on high cystine diets, interlobular necrosis of the liver has been noted in the rats of the preceding study on an 8 per cent casein diet containing as little as 0.75 per cent of cystine, or about 2.5 times the cystine requirement for growth as measured biologically. Further increases cause progressively greater injury in a diminishing interval of time.

The sources of supply of vitamins A and D, O. ROSENHEIM and T. A. WEBSTER (*Nature [London]*, 120 (1927), No. 3021, p. 440).—In this letter, occasioned by emphasis at the 1927 meeting of the British Association for the Advancement of Science on the problem of an adequate supply of fat-soluble vitamins for the needs of the growing population of Great Britain, attention is called to easily accessible sources of vitamins A and D which have not been utilized to any extent as yet. These include sheep, calf, and ox livers, which have been found by the authors to be 10 times as rich in vitamin A as a good Newfoundland cod-liver oil and from 200 to 1,000 times as rich as butterfat, the body fats of certain fish which contain appreciable amounts of vitamin D but no A, and the body fat of eels, which has been found to contain not only vitamin D but vitamin A in an amount equivalent to that of some Norwegian cod-liver oils. As the most promising source of vitamin D, irradiated ergosterol is suggested. It is thought that by a study of the best conditions for the formation of ergosterol in yeast a practically unlimited supply should be available.

In the opinion of the author "the margarine manufacturers have, therefore, at their disposal, if they care to make use of them, means which should make a perfect biological substitute for butter accessible, without unduly raising the price of margarine. Moreover, by carefully controlled methods of manufacture it should be possible to supply a product of constant vitamin content, superior in this respect to natural butter, the vitamin content of which depends on too many uncontrollable factors of the food supply of the cow."

Determination of vitamin A content in liver oil of the dog-fish *Squalus sucklii* (preliminary note), H. N. BROCKLESBY (*Canad. Chem. and Metall.*, 11 (1927), No. 9, pp. 238, 239, figs. 2).—The content of vitamin A in the freshly prepared liver oil of the dogfish (*S. sucklii*) was compared with that of a standard cod-liver oil stated to contain 12,000 units of vitamin A per ounce, using curative and prophylactic tests with rats on the Zilva-Miura basal diet.

Comparisons of the weight increases of rats given cod-liver oil and the dogfish liver oil indicate that for equal volumes the dogfish liver oil contains between 5 and 10 times the number of units present in the cod-liver oil.

Vitamin studies.—XVI, Vitamin A in evaporated milks made by vacuum and aeration methods, R. A. DUTCHER, H. E. HONEYWELL, and C. D. DAHLE (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 85-94, fig. 1).—This continuation of the general series of vitamin studies reported from the Pennsylvania Experiment Station (E. S. R., 58, p. 88) is the second of the series on the vitamin content of evaporated milk (E. S. R., 56, p. 190).

The evaporated milk used in the present study was prepared on a semicommercial scale as in the vitamin B study, two processes being used, the vacuum and the aeration processes. Portions of both types of milk were sterilized by the fractional method. Samples of the raw milk used in the manufacturing process were also tested. In the preliminary work no attempt was made to provide the antirachitic vitamin, and prophylactic rather than curative methods were used. In the later work the ration was irradiated and the rats were kept on the basal diet until the vitamin A reserves were depleted, about 37 days being required for this. Two standards of growth were used, the Sherman-Munsell standard of 3 gm. a week and the standard of 6 gm. a week proposed by Javillier et al.⁴ The feeding was continued for 5 weeks, the reconstituted milk being fed at 1-, 1.5-, and 3-cc. levels. To eliminate possible seasonal variations various groups were started at different seasons of the year.

On 1 cc. of raw milk as the sole source of vitamin A, the average weekly rate of growth was practically equal to the Sherman-Munsell standard. On the vacuum process milk the rate of growth was 64.86, and on the sterilized evaporated milk by the same process 56.08 per cent of that on raw milk. On 1 cc. of reconstituted milk prepared from milk evaporated by the aeration process, growth was 37.83 and 34.45 per cent of that on the raw milk before and after sterilization, respectively. As the level of feeding the milk was raised growth was better, and slight differences between the different milks were less readily detected. At the 2.5-cc. level, the average gain per week was practically identical with the Javillier standard.

These results would seem to indicate that evaporated milks made by both the vacuum and aeration methods are slightly lower in their content of vitamin A than the raw milk from which they were made, and that aeration and sterilization increase the destructive effect to some extent.

In commenting on various phases of their work, the authors state that none of their animals showed signs of ophthalmia at the time the body weight

⁴ Bul. Soc. Chim. Biol., 7 (1925), No. 7, pp. 831-841.

became stationary and only about 80 per cent at the time the feeding of the milk was begun. On post-mortem examination evidences of ear and lung infection were more frequent in the group which grew at the rate of 3 gm. or less per week than in those growing at the rate of 6 gm. or more.

In regard to the choice of standards, the comment is made "we have the feeling that normal growth standards are not capable of detecting small differences in the vitamin content of foods, while we are also somewhat disturbed when we apply the Sherman-Munsell standard for the reason that we are in doubt regarding the influence of lowered resistance and infection on the results. While we are not yet ready to advocate it, we are inclined to favor the 'half normal' standard of Javillier, since health is fairly good at that rate of growth and biological response to small food additions seems to us to be fairly well marked."

Vitamin A potency of irradiated milk, G. C. SUPPLEE and O. D. DOW (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 227-239, figs. 7).—Further data (E. S. R., 57, p. 692) are given to indicate that milk irradiated either in dry or liquid form for short periods under suitable conditions shows no evidence of vitamin A destruction or other toxic effects.

The relation of the inorganic constituents of a ration to the production of ophthalmia in rats, J. H. JONES (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 139-146, figs. 3).—The author has demonstrated that the so-called salt ophthalmia described by McCollum, Simmonds, and Becker (E. S. R., 53, p. 767) is due to oxidative destruction of vitamin A caused by the catalytic action of the ferrous sulfate of the basal ration. If the butterfat is incorporated in the ration as often as every 5 days, this ophthalmia does not develop and the animals grow, but if it is added in amounts sufficient to last 6 or 7 weeks, ophthalmia develops in the course of 10 weeks or less, with subsequent loss of weight and death of the animals.

Studies on "salt ophthalmia," III, E. V. MCCOLLUM, N. SIMMONDS, and J. E. BECKER (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 9, p. 952).—A brief announcement that further studies on the cause of the ophthalmia observed in rats on diets furnishing sufficient vitamin A but excessive amounts of salts point to ferrous sulfate as being responsible for the eye changes observed. If the diet is made up daily it is capable of curing ophthalmia and bringing about resumption of growth, but if the ferrous sulfate remains in contact with the fat serving as a source of vitamin A there is apparently a destruction of the vitamin. This would seem to confirm the conclusions of Jones noted above.

The separation of a substance from oils which inhibits the destruction of vitamin A by ferrous sulfate, H. W. ESTILL and E. V. MCCOLLUM (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 157-162).—The authors claim to have separated from cod-liver oil and wheat germ oil by means of lithium chloride dissolved in pyridine a substance which inhibits the destruction of vitamin A by ferrous sulfate (see above). Although conclusive tests have not been made as yet, it is suggested that the substances separated by the method described may be vitamin E.

A quantitative study of the problem of the multiple nature of vitamin B, H. C. SHERMAN and J. H. AXTMAYER (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 207-212, fig. 1).—This investigation follows the general line of that of Smith and Hendrick (E. S. R., 55, p. 891), but differs from it and similar studies recently reported in the literature in that emphasis has been placed upon the development of a quantitative method for determining the relative proportions of vitamins F and G in vitamin B.

Ground whole wheat, autoclaved yeast, and dried skim milk were the foods tested, and the general technique followed was the usual method of determin-

ing vitamin B as developed by Sherman and Spohn (E. S. R. 51, p. 368) and Sherman and MacArthur (E. S. R., 57, p. 895). After preliminary feeding trials to establish a satisfactory level of the materials to be tested, directly comparable groups of rats were fed the basal diet alone and supplemented by 0.8 gm. daily of ground whole wheat, 0.8 gm. of autoclaved yeast, and 0.4 gm. each of the wheat and yeast, respectively. As shown by the average weight curves for each group, there was very slight growth at first followed by rapid decline on the basal diet alone, slight growth for a longer period and then stationary weight on the diet supplemented by whole wheat, rapid growth for about 10 days followed by equally rapid loss in weight on the basal diet supplemented with autoclaved yeast, and rapid growth for about 15 days followed by very slight loss and then maintenance at a higher level than on the whole wheat diet on the basal diet supplemented by equal parts of the whole wheat and autoclaved yeast.

These results indicate a marked supplementary relationship between the wheat and autoclaved yeast. Since autoclaved yeast has been shown to be rich in G but relatively low in F (0.2 gm. of dried yeast furnishing sufficient of both factors for the growth of young rats), whole wheat must be relatively richer in F than in G.

A similar comparison of skim milk, wheat, and autoclaved yeast showed no supplementary relationship between the milk and autoclaved yeast, but a marked one between milk and wheat, thus indicating that skim milk is richer in vitamin G than in F.

These conclusions were confirmed by systematic examination of the rats for symptoms of polyneuritis.

Vitamin effects in the physiology of microorganisms, C. H. WERKMAN (*Jour. Bact.*, 14 (1927), No. 5, pp. 335-347, fig. 1).—Confirming previous conclusions based on work with bacteria, yeasts, and fungi (E. S. R., 54, p. 308), the author reports that the addition of a vitamin B concentrate to the medium does not stimulate reproduction of certain nitrogen-fixing organisms, particularly *Azotobacter chroococcum*, although it may afford a transient stimulation as the result of adding readily available nutrients other than vitamin B.

"Until further knowledge is at hand, the meaning of the term vitamin should be restricted to those substances not carbohydrates, proteins, fats, or minerals essential to the growth and reproduction of suitable animals. The term can not at present be justifiably extended to include substances necessary for the growth and reproduction of microorganisms and certainly not to indicate any substance serving to stimulate the growth or reproduction of microorganisms."

Evidence concerning the reputed health value of fats, J. W. M. BUNKER (*Amer. Jour. Pub. Health*, 17 (1927), No. 10, pp. 997-1006).—This is a review of recent literature on the nutritive value of fats, leading to the conclusion that "until some criterion other than taste, appearance, or reputation can be devised for judging the nutritional value of fats as purchased, we must assume them to be unreliable sources of vitamins and dependable only for their universally high caloric value."

A note of warning is sounded against overemphasizing new discoveries in nutrition. "Occasionally the first flush of enthusiasm over new discoveries leads us into unwarranted expectations. It may be that some such phenomenon has been going on in regard to our attitude toward fats in the diet and their value as carriers of vitamins. In the light of the scientific facts, which have been adduced, it would seem to be indicated that such enthusiasm should be tempered with reason."

A bibliography of 70 titles is appended.

The nature of the structural changes in nerve endings in starvation and in beri-beri. H. H. WOOLLARD (*Jour. Anat. [London]*, 61 (1927), No. 3, pp. 233-237, figs. 10).—The results are reported of the histological examination of the nerve tissues of the experimental rats in the previously-noted investigation of Drummond and Marrian (*E. S. R.*, 56, p. 694).

A striking similarity was noted between the tissues of the rats deprived of vitamin B and of all food, although the lesions were less marked in the latter case. The only changes noted were in the intermuscular medullated motor and sensory nerves and their endings, these changes rapidly subsiding at a little distance from the muscles. The sympathetic and central nervous systems showed no abnormal anatomical changes.

These findings confirm the opinion of Drummond that beriberi, as it occurs in rats under experimental conditions, is really starvation arising from inability to assimilate food in the absence of vitamin B.

A study of the pellagra-preventive action of the cowpea (*Vigna sinensis*) and of commercial wheat germ. J. GOLDBERGER and G. A. WHEELER (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 39, pp. 2383-2391).—Extending their studies on the value of various foods as sources of the pellagra-preventive vitamin (*E. S. R.*, 57, p. 295) as determined on human subjects, the authors report that cowpeas contain relatively small amounts and commercial wheat germ somewhat larger amounts of this factor. "It would be advantageous to include in the dietary, particularly of those in the area of pellagra endemicity, milling products of wheat containing as high a percentage as practicable of the germ and the bran."

The treatment of persistent rickets. M. W. BLOOMBERG (*Amer. Jour. Diseases Children*, 34 (1927), No. 4, pp. 624-633, figs. 7).—This contribution from the Children's Memorial Hospital at Montreal consists of case reports on eight French-Canadian children over two years of age during the course of treatment of severe rickets, and of the general conclusions which may be drawn from the observations noted.

Attention is called particularly to the fact that in such persistent cases, continuing beyond the age at which rickets usually disappears, ordinary anti-rachitic therapy is inadequate, and it is only by administering very large doses of cod-liver oil and abundant exposure to sunlight that proper healing may be obtained.

"It is extremely difficult to fix the curative dose of cod-liver oil. From the observations presented here it would seem that one must take into consideration the duration and severity of the disease, the diet, the amount of sunlight the child receives, and possibly the age of the patient as well. The tendency has been to give rather too small amounts of the oil. Moreover, since in many of these children the disease persisted throughout the summer months, it would seem advisable to continue giving cod-liver oil during these months to premature babies and twins, as they are specially susceptible to rickets. This procedure does not produce nearly as much gastrointestinal disturbance as is commonly believed."

Ultra-violet radiation and actinotherapy. E. H. and W. K. RUSSELL (*Edinburgh: E. & S. Livingstone*, 1927, 2. ed., pp. XXXI+429, figs. 168).—This volume contains useful information on the various types of lamps employed for ultra-violet radiations, the chemical, physical, and biological effects of ultra-violet radiations, and the technique of ultra-violet treatment of various disorders.

The relation of inorganic iron to nutritional anemia. H. S. MITCHELL and M. VAUGHN (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 123-137, figs. 4).—In continuation of the investigation of the value of various iron compounds in the

treatment of nutritional anemia in young rats (E. S. R., 56, p. 494), data are reported on the hemoglobin response to a large number of the least astringent iron salts of widely varying properties.

Although the results obtained show some exceptions to the suggestion made in the previous paper that the availability of iron salts depends upon their solubility, the authors state that they have never found an insoluble iron compound which was well utilized. No evidence was obtained to indicate that the presence or absence of vitamin E influences iron assimilation, as suggested by Simmonds, Becker, and McCollum (E. S. R., 57, p. 296). The iron salts which have been tested in this and the previous study are grouped on the basis of the rapidity and height of hemoglobin response as follows: Good—ferric acetate, ferric albuminate, ferric chloride, and ferric citrate; fair—peptonized ferric oxide, saccharated ferric oxide, saccharated ferrous carbonate, and ferrous iodide; and poor—ferric oxide, ferrous carbonate, ferric potassium tartrate, ferrous lactate, ferrum reductum, and ferrous sulfate.

The experimental production of a new type of goitre unrelated in its origin to iodine, R. MCCARRISON (*Indian Jour. Med. Research*, 15 (1927), No. 1, pp. 247-263, pls. 3).—The author describes a new type of goiter produced in young rats by a diet containing more than 60 per cent of white flour or of a vitamin-deficient carbohydrate, 20 per cent or less of protein, with fats and inorganic salts, including iodine in adequate amounts, but no green vegetables or fruit. The appearance of the goiter, both macroscopic and microscopic, is described, with microphotographs of sections at different stages.

"The goiter arising in these circumstances is characterized by intense secretory hypertrophy which ultimately leads to exhaustion of more or less of the epithelia and its replacement by nonsecretory elements and fibrous tissue. These changes may be present without any marked increase in size of the gland. It seems likely that this type of goiter will be found to occur sporadically amongst white-flour-eating peoples; that the subjects of its progressive stage will be prone to develop Graves' disease, following such influences as fright, mental worry, pregnancy, lactation, and attacks of acute infectious disease; and that the subjects of its retrogressive stage will exhibit greater or lesser degrees of myxedema. If this type of goiter be found to prevail sporadically in white-flour-eating peoples, the additional provision of iodine in the food will not prevent it, but a well-balanced vitamin-rich diet will."

TEXTILES AND CLOTHING

Protection afforded the skin against sunburn by textile fibers, K. HESS, J. O. HAMILTON, and M. JUSTIN (*Jour. Agr. Research* [U. S.], 35 (1927), No. 3, pp. 251-259, figs. 2).—This is the complete report, with description of the technique employed, photographic illustrations, and experimental data, of the investigation at the Kansas Experiment Station which has been noted from a preliminary report (E. S. R., 56, p. 898).

Size of bamboo fibre and its variation with certain constituents, K. NISHIDA and K. WAKAMIYA (*Cellulose Indus.* [Tokyo], 3 (1927), pp. 181-191; *abs. in Jour. Soc. Chem. Indus., Brit. Chem. Abs. B*, 46 (1927), No. 37, pp. 698, 699).—The bamboo fiber increases in length as the stem is ascended to a maximum at about the eighteenth node and then decreases to the top, while the breadth of the fiber decreases continuously, although above the eighteenth node the change is small. Interior fibers are longer and broader and contain less lignin than those in the exterior portion of the stem.

Solving the flax problem, C. R. CARTER (*Textile Recorder*, 45 (1927), No. 535, pp. 55-61, figs. 13).—Modern tendencies in flax production, harvesting, retting, drying, and scutching, and new machinery are reviewed, with comment on the activities of the Linen Industry Research Association.

Studies of the occurrence and elimination of kemp fibers in mohair fleeces, J. I. HARDY (*U. S. Dept. Agr., Tech. Bul. 35* (1927), pp. 16, figs. 12).—Forty-seven samples of commercial mohair and 27 samples from improved Angora goats were studied to determine some of the characteristics and properties of kemp found in mohair produced in the United States, South America, and Turkey that may be applied to the production of better mohair. The samples were cleaned and dyed a light shade of red, and cross and longitudinal sections of the stained fibers were studied microscopically and measured.

Of the 47 commercial samples, 35 represented main sorts and 3 showed entire freedom from kemp. Two of these samples contained fine underfibers which are objectionable. Of the 27 samples from Angora goats, 6 were free of kemp, but 2 of these had many medullated fibers, which are also objectionable. The diameter of the commercial mohair was 0.029 mm and of the improved mohair 0.033 mm., while the diameter of the kemp of the same group of fibers was 0.03 and 0.027 mm., respectively. The average diameter of the kemp measured microscopically was 0.052, while that of the improved mohair was only 0.046 mm. Difficulty was encountered in finding kemp in the samples of improved mohair, indicating less of it present than in the commercial mohair. The very lustrous samples of mohair were free from medullated fibers, but as the fibers became coarser there was a greater tendency toward medullated fibers. Judging from the quality of the mohair samples from the improved Angoras it is thought that it should be possible to establish flocks by systematic breeding free from kemp, and thus improve the quality of the mohair grown in the United States.

Present trends in home sewing, R. O'BRIEN and M. CAMPBELL (*U. S. Dept. Agr., Misc. Pub. 4* (1927), pp. 16).—Previous studies of the extent of sewing in the home are summarized briefly, and the results are reported and discussed of a recent survey conducted by the Bureau of Home Economics in 32 States and the District of Columbia. Of the 1,981 women who filled out the questionnaires, 138 did not give the size of the community in which they lived. 668 lived on farms, 427 in towns under 5,000, 197 in towns of 5,000 to 10,000, and 551 in cities of 10,000 or over. The assembled results do not give the total amount of home sewing done, but show the relation of the quantity of home sewing to size of income and size of community, the types of garments which are being made, the greatest difficulties that women encounter in home sewing, the proportion who own and use sewing machines and attachments, and the reasons for making garments at home or buying them ready-made.

More than two-thirds of the women stated that they were making nine or more different kinds of garments for men, women, and children. More home sewing was done in smaller than in larger communities, in families with small than large incomes, and in large than in small families. Among the difficulties and problems mentioned were fitting, altering patterns, and choosing becoming materials, satisfactory patterns, and becoming and practical designs. A large percentage had sewing machines, but very few took advantage of the attachments. The chief reasons given for buying ready-made garments were to save time and energy, to get better style and design, and for greater satisfaction, and for making garments at home to lower the cost and to get materials of better quality.

NOTES

California University.—The return from sabbatical absence is noted of Dr. R. E. Clausen, associate professor of genetics, who has been on leave since July 1, 1926, and of Miss Harriet G. Eddy, State home demonstration leader, who has been on leave since January 1, 1927. The latter spent considerable time in Russia, where she was afforded special opportunities for studying the system of agricultural extension work, including methods of instructing farm women and the agricultural library system.

Maine University and Station.—Charles H. Merchant, head of the department of agricultural economics, and Theodore T. Ayers, assistant plant pathologist, have been given leave of absence for the purpose of graduate study for the present semester and the college year, respectively. Miss Edith C. Merchant has been appointed assistant in plant pathology, and Miss Gail M. Redfield assistant in home economics research.

Massachusetts College and Station.—Dr. J. B. Lindsey was succeeded January 1 by Dr. J. S. Chamberlain as head of the department of agricultural chemistry, continuing, however, as research professor and head of the department of plant and animal chemistry of the station. Dr. David Rozman has been appointed assistant research professor of agricultural economics.

F. J. Sievers, head of the department of soils of the Washington College and Station, has been appointed director of the station, effective February 1.

Mississippi Station.—R. H. Smith, research assistant chemist, resigned October 1, 1927, to engage in graduate work at Johns Hopkins University and was succeeded by Marvin Gieger.

Missouri University and Station.—Dr. Hans Jenny of the Agricultural Chemical Experiment Station of Zurich, Switzerland, has been given an appointment in the department of soils, substituting for Dr. Richard Bradfield, who is spending a year's leave of absence at Kaiser Wilhelm Institute in Berlin.

Rutgers University and New Jersey Stations.—Additional laboratory facilities were provided during the summer of 1927 by the following special appropriations of the State legislature: For installing and equipping nutrition laboratories \$10,000, for installing and equipping sewage laboratories \$15,500, and for equipping laboratories in the entomology building \$2,000.

The State Department of Agriculture has turned over to the stations a project involving the monthly inspection and annual certification of trap-nested birds on breeders' farms throughout the State.

Recent appointments include Dr. Robert L. Starkey as associate microbiologist and assistant professor of soil microbiology, O. N. Massengale as poultry nutrition specialist, and Parker I. Tappen as inspector of the trap-nesting project.

South Dakota College and Station.—M. D. Farrar, apiculturist, resigned September 30, 1927, and has been succeeded by M. K. Riley. E. P. Crossen and C. A. Bonnen, assistant professors and assistants in farm economics, resigned October 15 and December 1, respectively, the latter being succeeded by Ralph H. Rogers, previously farm management demonstrator. F. H. Helmreich, instructor and assistant in animal husbandry, has been granted leave of absence for advanced work at the Ohio State University.

Wyoming Station.—H. F. Eppson has been appointed service chemist in the research chemistry department.

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No. 4

An unusual opportunity for contacts and conference was afforded research workers in agricultural economics and rural sociology by the group of meetings held in Washington in the closing week of December, 1927. These meetings brought together the membership of the American Farm Economic Association, the American Economic Association, the American Political Science Association, the American Sociological Society, the Agricultural History Society, the American Historical Association, the American Statistical Association, and several other organizations of kindred interests and aims. For most of these bodies the attendance was large and representative, and one of the most striking characteristics revealed by the joint program was the significance attached to research and the attention given to means for its strengthening and upbuilding.

From the viewpoint of agricultural research, interest naturally centered around the gatherings of the workers in agricultural economics and rural sociology, and in both groups the response was both positive and substantial. The American Farm Economic Association devoted practically the entire time of three half-day sessions to a consideration of research problems and the best methods for their solution. The principal opportunity open to rural sociologists was through the section on rural sociology of the American Sociological Society, and one of the three sessions of that section was occupied with a thoroughgoing discussion of the research outlook, methods and personnel, and means for assisting research agencies and increasing their effectiveness.

These outstanding meetings, however, were supplemented by others of more or less direct bearing which appeared at several points on the program. At the opening round table conference of the American Economic Association a paper was given on the scope and objectives of research in land economics and real estate. The American Statistical Association in discussing the topic Federal Statistics as Viewed by the Social Scientist included a paper on Agricultural Statistics by a member of the staff of the Food Research Institute, as well as several papers on the Statistical Evaluation of the Results of Social Experiments. The division on social research of the American Soci-

ological Society held a session for the presentation of brief reports on research projects, one of which dealt with the application of the statistical method to the study of wealth and welfare of farm families and another with the application of the case-history method to the study of the same subject. Papers were presented to the section on the community as to the impact of urbanism on rural areas and the new rural community, a case in rural-urban conflict, and the results of the use of a community score card covering a trade center and surrounding neighborhoods in West Virginia; to the division of social psychology on the relation of the farmer to rural and urban groups; and to the rural sociology section on the status of rural sociology in colleges and universities, on the content of rural sociology textbooks, and on the population, food supply, and American agriculture. Mention should also be made of the conference arranged by the American Historical Association on the promotion of research, in which papers were presented by representatives of the American Association for the Advancement of Science, the American Council of Learned Societies, the Guggenheim Memorial Foundation, and the Social Science Research Council.

Not only were the interests of research thus brought forward at the meetings with both frequency and prominence, but its problems were presented in an unusually tangible way. Some much-needed discussion of general principles was heard, but attention centered largely upon the attainment of specific objectives. This definiteness was especially pronounced as regards agricultural economics and rural sociology, where it was largely due to the detailed studies of the situation which have been going on for some time under the auspices of the Social Research Council. An account of the beginnings of this undertaking appeared in these columns last July. Since that time what is termed a preliminary report has been prepared under the direction of the advisory committee on social and economic research in agriculture, covering the fiscal year ended June 30, 1927, and comprising five multigraphed volumes, four of which are devoted to economic research in agriculture in the United States and one to rural sociology. It was around this report that most of the research papers at the meeting were arranged. The principal findings as to the research situation brought out by the report were set forth in these papers in considerable detail, and opportunity was afforded for further elaboration and comment in discussions from the floor.

The volume dealing with rural sociological research was prepared by Dr. C. J. Galpin, of the U. S. D. A. Bureau of Agricultural Economics, aided by Drs. J. H. Kolb of Wisconsin, E. Dwight Sanderson of Cornell University, and C. C. Taylor of North Carolina. An explanation as to the purpose and progress of the inquiry was given by Dr. Galpin at the session of the rural sociology section

in a paper entitled *New Forces in Research*, and the content of the report itself was described by Dr. Kolb under the title of *Scope, Methodology, and Personnel in Research*.

During the past fiscal year, it was revealed, 86 studies were in progress in 27 States, while in the remaining 21 States no studies were under way in this field. The agencies at work included 27 agricultural colleges and experiment stations, 5 nonagricultural colleges or universities, 2 institutes of research, a like number of individuals, the U. S. Department of Agriculture, the Bureau of the Census, the Public Health Service, and the Children's Bureau.

The type of problems under investigation covered a considerable range. There were 25 studies of rural organizations, 16 each of rural population and standards of living, 5 of psychology of rural participants in associated effort, and from 1 to 3 studies each on the social aspects of rural health and rural local government, farm abandonment, the rural church, rural eugenics, rural leadership, and other miscellaneous studies.

The prevailing method of approach in these studies was the survey, this embracing no fewer than 59 of the 86 projects. Of the remainder, 8 were classified as statistical analyses, 7 as the case method, 4 as based on careful recording of facts as the facts occur, and 7 by the employing of official records and documents by the historical method.

As the committee pointed out, "it is worth noting that virtually all the studies reported are based upon data, i. e., facts or assumed facts, obtained by questioning a participant or a near-participant in the event, fact, transaction, or situation involved; i. e., the scientist relies upon testimony rather than upon the observation of his own senses. This dependence upon secondary data is the result, undoubtedly, of the comparative ease and cheapness of getting information from participants or those presumably acquainted at first hand with the situation involved, especially in view of the difficulties encountered when one person attempts to observe all parts of a complex situation. It is to be noted, furthermore, that the method by testimony necessarily limits the scientist to asking questions in terms of categories lying within the participant's experience." Inasmuch as in science as a whole "the significant concepts frequently lie outside the ordinary experience of the participant," the question is raised "whether rural social research is prepared to utilize methods of direct observation and experiment which have proved so successful in the physical sciences." The belief is expressed that the time is now at hand "for the method of direct observation of social facts, employing such patience, time, effort as will be necessary upon a single situation, to give some clue to essential but hidden categories."

In a paper presented by Dr. Eben Mumford of Michigan on *The Next Steps in Research*, the fact was emphasized that most of the rural sociology studies so far have been largely preliminary, but form a "frame of reference" for future work. Much that should be done is a problem of the individual as influenced by environment, but there are many group phases and a need of studying participation contacts as distinguished from onlooking. The breaking up of primary contacts into classes for analysis is a further step to be undertaken. The studies should extend through the entire life cycle of the farmer and his family, beginning with the preschool period and terminating with the days of senescence.

Some of the difficulties confronting research workers were emphasized in a discussion by Prof. E. L. Morgan of Missouri, who pleaded for a lessening of the teaching load, a more stabilized program with less shifting of projects from year to year, and wider contacts with other workers in science. Long-time programs on a more scientific and purely sociological basis but with increased consultation and cooperation with other research departments were regarded as very essential. The view was expressed quite frankly that the enlarged opportunity for constructive achievement since the passage of the Purnell Act had brought with it a correspondingly deepened responsibility, and that if rural sociologists were to be active participants in institutional programs they themselves must demonstrate their ability to assist positively and distinctively in the solution of the outstanding problems under investigation. Doubtless this was sound counsel, and there were many indications of appreciation and approval.

The rapid development and broad appeal of research in agricultural economics in recent years are illustrated by the four volumes, aggregating nearly 400 multigraphed pages, into which the results of the preliminary report of the survey in this field have been assembled. The bulk of this space, as in the case of the volume on rural sociology, is devoted to the details of the individual projects, but there is also considerable analysis and comment on the findings. These volumes were prepared by a committee of twelve, headed by Dr. H. C. Taylor of Northwestern University, and served at the meetings as the basis of a comprehensive discussion of scope and methods.

The survey indicated that during the past fiscal year 46 of the 48 State experiment stations had projects under way in agricultural economics. The majority of the stations reported from 1 to 5 projects each and an average expenditure of \$5,000 to \$20,000 per annum, but in 4 instances, Iowa, Illinois, Minnesota, and New York, the number of projects ranged from 20 to 44 each and the available funds

from \$40,000 to over \$60,000 per annum. The total for all stations was 332 projects, of which 125 were on farm management, 88 on marketing, and smaller numbers on commodity studies, area studies, agricultural history, prices, cooperation, land economics, roads, transportation, farm labor, taxation, credit, and wealth and income of farmers.

In opening the discussion before the American Farm Economic Association, Dr. Taylor referred to his topic, *The Field of Research in Agricultural Economics*, as "the most important subject with which the association is confronted at the present time." He pointed out that research in this field is on a much more quantitative basis than is that in general economics, but he pleaded for even more of analytical thinking both before and after the work is undertaken, recalling a characterization by Dr. Commons of such thinking as the brain work, while the collection of data is merely the foot work of the process. Thus far development has been largely, as the project list shows, along the line of increasing individual economic efficiency, leaving comparatively untouched group studies as a basis for State and National action. In this broader field greater attention will need to be given to agricultural history and geography as a background. More thorough fundamental training of workers he deemed another essential, pointing out that in 22 of the stations no economics workers have received the doctor's degree, and some have had little grounding in economic theory. Not only increased graduate study but a general adoption of a policy of sabbatical leave for study and travel was earnestly advocated.

Other speakers followed with a discussion of the situation in more specific phases. Thus Dr. J. I. Falconer of Ohio and L. H. Bean of the U. S. Department of Agriculture took up the theme of research in farm income, Prof. Eric Englund of the Department that of research in farm taxation, Dr. J. D. Black of Harvard University and Dr. O. C. Stine of the Department that of research in prices, and Dr. L. C. Gray of the Department that of research in land economics. As a special phase of the subject the research program of the Bureau of Agricultural Economics was discussed by Mr. N. A. Olsen, assistant chief of that bureau, and a paper prepared by Prof. H. C. M. Case of Illinois entitled *A State Program for Farm Management Research* was read by Mr. P. E. Johnston.

Perhaps the most notable characteristics of these papers as a group was their ready recognition of weaknesses and shortcomings in the existing situation. The reports revealed substantial progress as a whole under more or less serious difficulties, yet there was little of either complacent acceptance of the existing status or of apologetic justification. What was apparently desired and to a large

extent provided was constructive suggestion as to the things which needed to be done and the ways to do them more effectively. For example, Dr. Black emphasized the high order of research technique required in investigating the prices of farm products and the dangers inherent in such studies when carried on by men not adequately trained in statistical methods and related technique or, what is frequently even more serious, unable to interpret accurately the conditions and results and deduce principles therefrom. "Less mathematics and more logic" is the need at present, as seen by Dr. Black, who favored the concentration of comprehensive price research at a few well-equipped institutions so long as the supply of properly qualified workers is so limited, but with the cooperation of all States in gathering data and in handling the less complicated and less technical price problems.

Somewhat similarly as regards land economics studies, Dr. Gray called attention to the experiments in methodology in land utilization being carried on by the experiment stations of Colorado and West Virginia in cooperation with the U. S. Department of Agriculture and to the land economics survey being made by the Michigan Department of Conservation. The larger aspects and basic principles involved in land utilization and settlement, the profitableness of large scale versus small scale farming in different sections of the United States, the problems of the small negro and white tenant farmers of the South, and the factors affecting land values were also pointed out as problems urgently in need of investigation.

Increasing interest in farm taxation studies, some phases of which are now in progress in nearly half of the States, was indicated in Prof. Englund's paper. Most of the past research in taxation has been concerned with assessments and tax levies, and little has been done on the problems of expenditures, the diffusion of the benefits of public expenditures, and the shifting and incidence of taxation as they affect the farmer's position in the fiscal system. The investigation of taxes as a consumptive item (a benefit) as well as a productive cost (a burden), the levying of taxes for local improvements and services on larger governmental units to bring about a more equitable apportionment according to benefits received, the extent to which the higher taxes have forced land into higher uses and increased the quantity of farm products on the market, and the shifting of taxes on industrial and commercial groups to the farmer consumer or back to the farmer producer were cited, however, as some fields thus far hardly touched upon.

One session was devoted to the methodology employed and the results obtained in three specific investigations. Dr. H. A. Ross, of Cornell University, discussed a demand-for-milk study in New York

City made under his direction, and F. V. Waugh, of the Massachusetts State Department of Agriculture, one he had charge of on the quality factors influencing vegetable prices in the Boston market. The economic phases of the Michigan land economic survey, already referred to, were set forth in some detail by W. E. De Vries, of the Michigan Department of Conservation. At another session papers were presented and discussed on the effects of large scale production on the economics of cotton growing, effects of the corn borer on farm organization in the Corn Belt of the United States and Ontario, and the effects of improved machinery and production methods on farm organization in the winter wheat belt.

Many other phases of the situation, both in agricultural economics and rural sociology, found mention in the various reports and were more or less prominently before the meetings. Sufficient has perhaps been said, however, to indicate the well-conceived and enlightened efforts which are being made by organizations of the investigators themselves to bring about a clear understanding of just where research in these directions stands to-day. It is doubtful if at any time or in any field of research a more earnest attempt has been made in a systematic and orderly way to elevate standards and improve conditions than in the comprehensive survey now in progress. The value of such findings as have thus far been made available has been greatly increased by the consideration given them by the Washington meetings, and there can be little doubt that these meetings have thereby rendered a timely and valuable service. The expectation that the inquiries will still go on under the same auspices, with special attention centered upon the further improvement of methods and objectives, should be regarded as additional cause for gratification and encouragement, not merely by economists and sociologists but by all who have at heart the promotion of agriculture through the most effective mobilization of all research workers.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The second chemical conference, Brussels, April 16 to 24, 1925 (*2. Conseil de Chimie, Bruxelles, 1925. Structure et Activité Chimiques. Rapports et Discussions. [Brussels]: Inst. Internatl. Chim. Solvay; Paris: Gauthier-Villars & Co., 1926, pp. XIV+672, pls. 3, figs. 23*).—The papers presented at this meeting of the International (Solvay) Institute of Chemistry constitutes a series of symposia on the following subjects: Six papers on crystalline structure and the X-rays, by W. H. and W. L. Bragg and M. J. Duclaux; two papers on chemical activity, by Thomas, Martin, and Lowry and F. Swarts; and nine papers on reactivity of the molecules, by the following authors: Tiffeneau and Orékhoff, J. Perrin, M. A. Job, M. Eric and K. Rideal, E. F. Armstrong and P. Holditch, C. Moureu and C. Dufraisse, H. E. Armstrong, J. Duclaux, and H. von Euler. Under a separate heading of reports and discussions is reproduced a paper on The Spreading of Fluids upon Water and Solids and the Thickness of a Primary Film, by W. B. Hardy. Most of the papers are followed by discussions.

Some remarks on the colloid theory of cements, T. MAEDA (*Jour. Phys. Chem.*, 31 (1927), No. 6, pp. 933-936; also in *Inst. Phys. and Chem. Research [Tokyo] Sci. Papers*, 6 (1927), No. 98, pp. 265-269).—This is a theoretical discussion of the setting of cements, the specific examples being those of magnesium oxychloride and calcium sulfate cements. The view presented is based largely upon five investigations recently published, one by the author and S. Yamane and the others by the author of the present communication,¹ this experimental work having included (1) an examination of the composition of magnesium oxychloride cement, (2) viscosity changes during the reaction between magnesium oxide and aqueous magnesium chloride solution, (3) a study of magnesium oxychloride cement with X-rays, (4) observations of the aqueous vapor pressure of magnesium oxychloride cement and the state of water in the cement, and (5) the hardening of magnesium oxychloride cement, and the functions of free water, water of crystallization, and adsorbed water.

It is concluded that the setting of neither magnesium oxychloride nor calcium sulfate cements can be accounted for by either the classical interlocking crystal theory or the so-called colloid theory, and that the true mechanism is better represented by a theory "which involves both crystal and colloid ideas," the formation of minute crystals of colloid particle dimensions together with a conversion of free water into water of crystallization and adsorbed water—"the adsorbed water reminds us of a thin water film between two glass plates"—constituting essential features of the new explanation.

"To prevent brittleness, the adsorbed water is necessary, and interlocking crystals without adsorbed water make a brittle mass as magnesium oxide and water illustrate."

¹ *Inst. Phys. and Chem. Research [Tokyo] Sci. Papers*, 4 (1926), No. 50-51, pp. 85-128; 5 (1926), Nos. 73, pp. 95-102; 75-76, pp. 133-154.

New investigations on pectin substances [trans. title], F. EHRLICH (*Ztschr. Angew. Chem.*, 40 (1927), No. 45, pp. 1305-1313).—This is an historical review, briefly noting the progress of pectin investigations from Braconnot's discovery in 1825 of a gelatinous substance in fruit juices¹ up to investigations published in 1926. A footnote bibliography of 34 numbers gives references to a large number of papers on the properties and chemical constitution of the pectins.

[Blood chemistry work at the Pennsylvania Station], A. K. ANDERSON and H. E. HONEYWELL (*Pennsylvania Sta. Bul.* 213 (1927), p. 7).—Brief progress reports on the blood chemistry of the albino rat and of dairy cattle note the determination in the first case of such nonprotein nitrogenous constituents as urea, creatinine and creatine, and uric acid, together with glucose and chlorides, the total nonprotein nitrogen and urea figures being slightly higher than for normal human blood. In the case of the blood of dairy cattle, a preliminary observation is noted that both before and after calving the blood of heifers raised on a vitamin B free diet varied from the normal.

Rapid boiling as an aid to a shortened period of digestion in the determination of nitrogen, O. M. SHEDD (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 4, pp. 507-520).—This paper proposes, on the basis of a large number of experimental determinations carried out at the Kentucky Experiment Station, a shortened form of the Kjeldahl-Gunning-Arnold method (E. S. R., 4, p. 387) for the determination of nitrogen, the recommended procedure being as follows:

Place the sample in a round bottom Pyrex flask of about 800 cc. capacity, add 18 gm. of dry sodium sulfate and mix thoroughly with the sample, and add further 25 cc. of sulfuric acid (sp. gr. 1.84) and 0.7 gm. of mercury. Heat strongly over a powerful burner for 20 minutes, or for at least 10 minutes after clearing. Allow the contents to cool, add 300 cc. of distilled water, then a mixture of 70 cc. of 63 per cent sodium hydroxide and 25 cc. of 4 per cent potassium polysulfide, and finally not over 0.1 gm. of granulated zinc. Distill over a free flame Bunsen burner, using a block-tin tube condenser with a trap. Continue the distillation until the solution in the flask commences bumping. Collect the distillate, about 200 cc., in an excess of standard sulfuric acid containing 4 drops of alizarin sodium sulfonate (1 per cent aqueous solution), and titrate with 0.1 N sodium hydroxide. Blank determinations on the reagents should be made and the results corrected accordingly.

A large amount of analytical data, mostly from the results of comparisons of the above short digestion method with the 3- and 5-hour digestions, are given in support of the conclusions (1) that, with the exception of such stable nitrogen compounds as pyridine, the short digestion is as satisfactory as the long; (2) that the use of mercury as oxidation catalyst is essential in the short method, though copper is as satisfactory as mercury in the long digestion for all of the large number of materials tested with the single exception of pyridine, and that copper mercury mixtures have no advantages; and (3) (based on data in which varying quantities of sodium hydroxide, potassium polysulfide, copper sulfate as oxidation catalyst, zinc, and distilled water were used in the distillation) that the distillation should be conducted with the use of the minimum quantity of sodium hydroxide sufficient for the liberation of ammonia, the minimum quantity of zinc necessary to prevent bumping (not over 100 mg.), and, finally, the precipitation of the mercury or copper catalyst with potassium polysulfide.

The spectrophotometric detection of boron, W. C. HOLMES (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 4, pp. 522, 523).—The turmeric paper test for

¹ Ann. Chim. et Phys., 2. ser., 28 (1825), pp. 173-178; 30 (1825), pp. 96-102.

boric acid is stated to be sensitive to 1 part in 8,000, while the use of an alcoholic extract of turmeric furnishes a test sensitive enough to permit the detection of 0.002 gm. of boric anhydride. By the use of a spectrophotometer, the author finds it possible so far to increase the sensitiveness of the method that 1 part of boron in 25,000,000 parts of the aqueous solution can be detected. The recommended procedure may be outlined as follows:

Extract the turmeric with 95 per cent alcohol and dilute with the same solvent to make the final solution contain from 50 to 60 mg. of total solids. Transfer 1 cc. of the aqueous solution to be tested to a porcelain dish. Acidify with 1 cc. of glacial acetic acid and add 2 cc. of the turmeric solution. Evaporate the combined solutions on the steam bath and redissolve the residue in 5 cc. of acetic acid. Carry out a blank test in precisely the same manner, using 1 cc. of distilled water. Determine the extinction coefficients of the final acetic acid solutions in 2 cm. layers over the spectral range 495 to 510 $m\mu$. In the presence of boron the extinction coefficients of the test solution will exceed those of the blank test. Figures showing distinct differences in the extinction coefficients at 495, 500, 505, and 510 $m\mu$ between blank tests and solutions containing 0.5 and 1 part of boric acid or borax per million parts of water are tabulated.

A study of the so-called potassium chlorate method for the determination of manganese [trans. title], M. MARQUEYROL and L. TOQUET (*Ann. Chim. Analyt.*, 2. ser., 9 (1927), No. 10, pp. 289-295).—Referring briefly to several modifications of the method of determining manganese by precipitation as manganese dioxide from nitric acid solution by heating with potassium chlorate, the first definition of the conditions for the quantitative use of this reaction being apparently that of Hampe,¹ the author reports experiments on the solubility of the precipitated manganese dioxide in the nitric acid under various conditions of temperature, concentration of acid, etc.; on the proportion of potassium chlorate necessary to effect quantitative precipitation; and on some other details of the procedure: Concluding that (1) in the absence of chlorine compounds nitric acid dissolves significant quantities of manganese dioxide whether at the boiling temperature or at the temperature attained on a boiling water bath; and (2) the presence of chlorine compounds almost entirely suppresses the tendency of the manganese dioxide to redissolve in nitric acid, especially if the acid be rather concentrated, the quantities of potassium chlorate necessary to prevent solution of the manganese compound decreasing with increasing concentrations of acid. This is considered to explain previous failures of the method, the procedure having been such as to cause almost total disappearance of the chlorine compounds. To make the method dependable, it is stated, it appears necessary only to use sufficiently concentrated nitric acid and to heat on the boiling water bath instead of boiling directly, under which conditions the proportion of chlorate added may be considerably decreased. In two hours' heating, 50 cc. of nitric acid of specific gravity 1.332 dissolved in the presence of 0.2 gm. of potassium chlorate less than 0.0001 gm. of manganese, while in the absence of the chlorate 0.0051 gm. of manganese in one test and 0.0060 gm. in another was dissolved.

Note on the determination of total solids in malt vinegar, J. F. LAUDIE (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 4, pp. 520, 521).—The Official method (E. S. R., 55, p. 11) for total solids in vinegar gave the author of this note excellent results when applied to cider vinegars, but led to figures varying by as much as 0.8 per cent when duplicate analyses were carried out under

¹ Chem. Ztg., 7 (1882), No. 69, pp. 1103-1110; 9 (1885), No. 85, p. 1513.

different conditions of atmospheric humidity when the method was applied to malt vinegars. Even in the case of cider vinegars, Woodman (E. S. R., 52, p. 118) found similar irregularity in the results and attributed the error to a retention of acetic acid by the vinegar solids. An additional re-solution of the solids in distilled water with subsequent re-evaporation remedied the difficulty with respect to consistency of results, but gave significantly lower figures for the total solids in the case of the malt vinegars, though for cider vinegars the differences were not important. Some such modification of the Official method would seem to be desirable. The procedure is as follows:

"A 10 cc. sample is measured into a tared, flat-bottomed platinum dish of 50-mm. bottom diameter, evaporated on a boiling water bath for 20 minutes, taken up in 5-8 cc. of distilled water, again evaporated and taken up with 5-8 cc. of distilled water, and finally evaporated to dryness (30 minutes), dried for exactly 2.5 hours in a water oven at the temperature of boiling water, cooled in a desiccator, and weighed."

Note on the assay of sulfonal tablets, L. E. WARREN (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 4, pp. 523-526).—A fairly complete survey of the literature having revealed no method for the determination of sulfonal in tablets, the author made some experiments with three procedures for this determination, and suggests the two following:

"Weigh 10 tablets individually; ascertain the average weight and the individual variations. Pulverize the tablets and pass the powder through a No. 60 sieve.

"**Method I.**—Weigh a sufficient quantity of the powder to represent at least 5 grains of sulfonal. Macerate the powder in a small beaker with 10 cc. of chloroform and decant the solvent through a small filter. Repeat the extraction with chloroform until the powder is exhausted of sulfonal. Wash the filter with a few cubic centimeters of fresh chloroform and evaporate the united solvent in a tared dish at ordinary temperature by the aid of a gentle current of air. Dry the residue to constant weight in a desiccator over sulfuric acid.

"**Method II.**—Weigh a sufficient quantity of the powder to represent at least 5 grains of sulfonal and extract it with chloroform in a Bailey or a Soxhlet extractor until completely exhausted of sulfonal. Evaporate the solvent in a tared dish at ordinary temperature by the aid of a gentle current of air. Dry the residue to constant weight in a desiccator over sulfuric acid."

The iodometric evaluation of methylene blue, W. C. HOLMES (*Jour. Assoc. Off. Agr. Chem.*, 10 (1927), No. 4, pp. 505-507).—The formation in the Official method for the determination of methylene blue of a definite compound of iodine with the dye (E. S. R., 55, p. 11), 5 atoms per molecule, is questioned, together with the alleged acceleration of the reaction, bringing about the largest possible proportionate absorption of iodine, by acetic acid. The author's experiments appear to show that, so far from accelerating iodine absorption by methylene blue, the presence of acetic acid restricts this reaction, though the effect of slight variations in acidity was found negligible. Large variations in the proportion of acetic acid, on the other hand, cause, according to the tabulated data presented, marked changes in the proportion of iodine absorbed, the extreme figures being 5.60 gm. atoms of iodine absorbed by 1 gm. molecule of methylene blue in the absence of acid, and 4.86 gm. atoms of iodine per gram molecule of dye when 45 cc. of glacial acetic acid was used. The procedure of the Official method was followed in these experiments with the exception of the variations in the concentration of added acid.

In a second series of experiments, in which the conditions were those of the Official method except with respect to the concentration of the dye, it was

shown that, while 0.100 gm. of anhydrous methylene blue took up 4.91 gm. atoms of iodine per gram molecule of dye, 0.020 gm. of the same preparation combined with 5.50 gm. atoms of the halogen per gram molecule. The reaction involved is not, therefore, in the author's opinion, that of the formation of a complex of definite atomic proportions under the conditions of the experiments noted.

"It is the concentration of residual iodine in the solution that determines the iodine absorption. The Official method is fundamentally faulty in ignoring the operation of that factor." It is concluded that for accurate work this method must be calibrated for variation in dye concentration.

METEOROLOGY

The weather of 1927 as related to solar changes, H. H. CLAYTON (*Bul. Amer. Met. Soc.*, 8 (1927), No. 10, pp. 152, 153).—Certain long-period weather changes in 1927, first warm and dry, then cool and wet, and finally warm and dry again, were, in the author's opinion, "intimately related to preceding solar conditions." Temperature forecasts based on the solar data "have not been uniformly successful," but "with increasing experience and knowledge and with more accurate and complete solar data there seems every reason to believe that the accuracy of such forecasting will increase."

Relation between the temperatures of certain months of the year [trans. title], L. BESSON (*Compt. Rend. Acad. Sci. [Paris]*, 183 (1926), No. 19, pp. 802-804, figs. 2; *abs. in Sci. Abs., Sect. A—Phys.*, 30 (1927), No. 352, pp. 259, 260).—Study of fluctuations from year to year of mean monthly temperatures at a number of stations indicated that there is a close similarity between the April and July sequences, the curves being roughly parallel if the July records are retarded by approximately seven years. "Correlation coefficients between the mean temperatures of April and of July seven years later are: Paris (1803-1926) 0.404, Paris (1851-1926) 0.362, Strasbourg 0.364, Nantes 0.352, Geneva 0.320, Vienna 0.245, Greenwich 0.201. The Paris data also indicate weaker correlation between the temperatures of May and December eight years later, and an inverse variation between November and January six years later."

Indications of the (1927-28) seasonal rainfall in southern California, G. F. MCEWEN (*Bul. Amer. Met. Soc.*, 8 (1927), No. 10, pp. 157, 158).—Various proposed methods of forecasting seasonal rainfall of southern California, as for example those of Blochman (*E. S. R.*, 54, p. 714), French (*E. S. R.*, 57, p. 506), I. R. Tannehill, and the author (*E. S. R.*, 54, p. 714), as applied especially to the season of 1927-28, are briefly noted. It is stated that none of these methods have "been proven to have an adequate physical basis. They are not absolute, but only express probabilities regarding the coming season. The general conclusion is that about an average amount of rainfall may be expected for the 1927-28 season."

Meteorological observations (*Maine Sta. Bul.* 335 (1926), pp. 290, 291).—A summary is given of monthly and annual temperature, precipitation, cloudiness, and wind during 1926, at the University of Maine, Orono. The mean temperature for the year was 39.94° F., as compared with 42.725° for 58 years. The precipitation was 54.57 in., as compared with the 58-year mean of 41.64 in. The snowfall was 109.2 in., the number of clear days 131.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. BAUMGARTNER (*Massachusetts Sta. Met. Buls.* 465-466 (1927), pp. 4 each).—The usual summaries and notes are given of observations at Amherst, Mass., during September and October, 1927.

Climatological summary for State College, Pennsylvania, 1926 (*Pennsylvania Sta. Bul. 213 (1927), p. 35*).—A summary is given of monthly and annual temperature, precipitation, and cloudiness. The annual temperature was 48.2° F., 1° below the 42-year normal. The extremes of temperature were 97° July 22 and —5° January 29. The precipitation for the year was 41.61 in., 2.39 in. above the normal. The snowfall was 58.45 in. There were 85 clear days.

Climatic conditions (*U. S. Dept. Agr., Tech. Bul. 17 (1927), pp. 5–8*).—Observations on precipitation, evaporation, temperature, and wind movement at the Dry-Land Field Station, Ardmore, S. Dak., 1912–1925, are summarized, with brief comments on the character of the seasons.

The average annual precipitation, 1912–1925, was 16.43 in., the lowest being 11.74 in. in 1924 and the highest 30.41 in. in 1915. The average evaporation for April–September, 1913–1925, was 36.86 in. The highest temperature recorded was 103° F. July 28, 1917, June 29, 1919, July 25, 1919, July 22, 1920, June 22, 1922, August 2, 1924, and July 13, 1925; the lowest —34° January 11, 1916. The average annual frost-free period, 1913–1925, was 138 days, May 9–September 24. The length of the period varied from 121 days in 1916 to 157 days in 1923. All small grains were completely destroyed and other crops badly injured by hail in 1914 and 1922.

SOILS—FERTILIZERS

Soil survey of Grant County, South Dakota, W. I. WATKINS and W. H. PIERRE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III + 1649–1679, fig. 1, map 1*).—This report, prepared in cooperation with the South Dakota Experiment Station, maps and describes in 10 series of 23 types the soils of an area of 438,400 acres in the northeastern part of the State, varying in topography from a practically flat strip about 7 miles wide immediately east of the hills, through undulating and rolling, to rough country, and including rough stony land, unclassified, to the amount of 1.5 per cent of the total area of the county. The more extensive types are Barnes loam, which, with the inclusion of shallow, and rolling stony phases, covers 42 per cent of the county; Barnes silt loam, amounting to 10 per cent; and Fargo silt loam, more than half of which is comprised in a meadow phase, 9.8 per cent.

The effect of desiccation on various soil types in the Chernozem and Podzol zones of European Russia [trans. title], A. LEBEDIANZEF (*Compt. Rend. Acad. Sci. [Paris], 185 (1927), No. 11, pp. 568, 569*).—The relative response to desiccation was determined for 12 soils, the data obtained being presented in the form of tables showing the yield given by the desiccated soils as calculated on the basis of a yield of 100 for the same soil untreated. For the Chernozem zone soil types total yield and grain yield, respectively, are given as follows: Slightly transformed (dégradé) Chernozem 184 and 169; markedly transformed Chernozem 174 and 159; deep-gray forest soil 159 and 141; and gray forest soil 157 and 143. For the Podzol zone soil types total yields only are given, as follows: Slightly and markedly podzolized clay soil 117 and 124; slightly and markedly podzolized sandy soil 113 and 119; slightly and markedly podzolized argillaceous soil, fallow, 130 and 143; and slightly and markedly podzolized sandy soil, fallow, 126 and 101.

It is concluded that all the transitional types from Chernozem soils, the transformation of which has hardly begun, to fully podzolized clay soils show positive response to desiccation, the response being, among podzol types, most marked in the cases of fallow soils.

The fermentation characters of the root nodule bacteria of the Leguminosae, I. L. BALDWIN and E. B. FRED (*Soil Sci.*, 24 (1927), No. 3, pp. 217-230).—The fermentation of 60 cultures of root nodule bacteria, including organisms associated with alfalfa, clover, peas, beans, soy beans, cowpeas, and dalea, together with *Bacillus radiobacter*, was determined in agar media of low buffer capacity containing bromothymol blue as indicator. Under these conditions, with the exception of the failure of the method to separate the soy bean and cowpea groups, the fermentation characters were found sufficiently definite and pronounced to permit separations in accordance with the cross-inoculation groups. The considerable body of data from which these conclusions are drawn is tabulated, and the significance and utilization of the recorded observations are discussed.

Nitrification in soils, II, H. N. BATHAM (*Soil Sci.*, 24 (1927), No. 3, pp. 187-203, figs. 3).—Extending previous work on the nitrification of amino acids and other organic compounds (E. S. R., 55, p. 120), the author presents in this second communication the results of pot nitrification experiments on the alkaloids nicotine, brucine, and strychnine, the amino acids histidine, lysine, and arginine, glutamic acid, aspartic acid, asparagine, and hippuric acid, and on the purines uric acid and xanthine, in comparison with the ammonification rate shown by ammonium sulfate under the same conditions, together with a considerable number of conclusions which may be summarized in part as follows:

"The members of the mono-amino-dicarboxylic acid series are slightly more nitrifiable than those of the mono-amino-mono-carboxylic acid series. There is greater accumulation of nitric nitrogen from arginine than from lysine. The data indicate the superiority of diamino-mono-carboxylic acids to mono-amino-dicarboxylic and mono-carboxylic acids as regards nitrifiability in the soil. They have also given higher results than those given by heterocyclic amino acids, which are only slightly better than the dicarboxylic acids. Asparagine has shown better nitrifiability than aspartic acid. The general trend of the nitrification of hippuric acid appears very similar to that of mono-amino-mono-carboxylic acids. Brucine and strychnine have not only shown least nitrification values but have also given negative results. But the toxic effect of these poisonous compounds in the soil is only temporary, and when they are removed the phenomenon of nitrification again takes place. Xanthine and uric acid are proved to be the most readily nitrifiable organic compounds so far used except nicotine and arginine. None of the nitrogenous organic compounds could compete with ammonium sulfate in nitrifiability. It appears that the ring nitrogen . . . resists the action of the microorganisms of the soil to a greater extent than the chain nitrogen. . . . Organic compounds of nitrogen having more complex formulas than the simpler mono-amino-mono-carboxylic acids indicate a fairly close relationship between the nitrification values and the nitrogen-carbon ratios. . . . The soil containing additional nitrogenous organic compounds shows slightly higher pH values than the soil without them."

Nitrate accumulation under a mulch, A. B. BEAUMONT, A. C. SESSIONS, and O. W. KELLY (*Soil Sci.*, 24 (1927), No. 3, pp. 177-185, fig. 1).—In the special conditions described, nitrate accumulation was found at the Massachusetts Experiment Station to be uniformly greater—and, in view of the results of Albrecht (E. S. R., 48, p. 720), strikingly greater—under a mulch composed of waste hay and straw on uncultivated plats than in cultivated plats without the mulch. The lime absorption and the H-ion concentration were distinctly higher under the mulch than in the cultivated plats. The nitrate accumulation in the cultivated plats without mulch at but three times (all within the most active growing period, when the draft on nitrates was greatest), at all closely

approached that in the mulched, uncultivated plot. Special conditions believed to account for the contrast in the results between these experiments and those of Albrecht, above cited, include (1) the use of a light, loose, well-drained, "and assumably well aerated" soil (Gloucester sandy loam, under cultivation as an apple and pear orchard); (2) the accumulation and decomposition of the mulch material until much readily nitrifiable matter was present; (3) oxidation and hydrolysis, respectively, of the carbohydrates and proteins of the fresh mulch; and (4) the protection against leaching afforded by the heavy mulch. Tabulated data show the chemical and physical conditions of the experiments and the numerical results. It is concluded that, under the conditions detailed, a mulch is more effective than cultivation in bringing about nitrate accumulation.

[Soil and fertilizer tests in Arkansas] (*Arkansas Sta. Bul. 221 (1927), pp. 46-48, 49-51, 52, 57, 62, 63, fig. 1*).—Brief progress reports covering rotation and fertilizer experiments, comparisons of forms of nitrogen, lime, and phosphorus, the effect of cultivation on nitrate production and the retention of moisture in soils (E. S. R., 55, p. 121), and other topics are presented in continuation of earlier work (E. S. R., 56, p. 319).

The best average results in nitrogen experiments on corn were obtained from cottonseed meal, ammonium sulfate taking second place. The highest average wheat yield, 28.4 bu. per acre, was secured by furnishing nitrogen as sodium nitrate, with the addition of lime, acid phosphate, and potash. Ammonium sulfate gave the best hay crop. For corn, rock phosphate in conjunction with lime and manure produced the largest yields, with bone meal as the next best treatment. Bone meal stood first as a source of phosphorus for wheat when combined with lime and manure, the next highest yield having come from rock phosphate in the same combination. The hay crop was best on the bone meal, lime, manure combination, but rock phosphate, acid phosphate, and basic slag also gave good returns.

The largest increase in corn yield reported from experiments on the effect of legumes upon the succeeding crops was 22 bu. per acre, following the plowing down of cowpeas. Cutting cowpeas for hay reduced the increase in corn yield to 11.7 bu. A number of similar experiments are reported with soy beans and velvet beans.

Equal quantities of nitrogen from ammonium sulfate and sodium nitrate appeared to be a safe and effective source of nitrogen for cotton at the Marianna Substation.

In resistance to acid soil conditions the legumes studied were found to group as follows from the lowest to the highest resistance: Red clover, vetch, serradella, California bur clover, spotted bur clover, Lespedeza, and velvet beans. A conclusion is drawn from these experiments that the value of liming does not depend primarily upon the neutralization of acidity, but rather upon reaction with other elements in the production of plant growth.

Vetch made fair growth on rock phosphate, and sweet clover made as much growth on rock phosphate as on acid phosphate. Cotton, sorghum, cowpeas, serradella, bur clover, rice, beggarweed, and Lespedeza made better growth on acid phosphate than on rock phosphate.

In experiments to determine the minimum concentration of potash for various crops in culture solution, the higher concentrations produced, in general, the greatest plant growth, and 2 parts per million were found minimal for the maximum growth of oats, while 1 part per million seemed sufficient for alfalfa. Soy beans and tomatoes appeared to require from 3 to 5 parts per million of potassium.

[Soil management and fertility studies at the Illinois Station], F. O. BAUER ET AL. (*Illinois Sta. Rpt. 1927*, pp. 7-39, figs. 7).—The progress of a large number of investigations on soils and soil fertility is reported, continuing previous work (E. S. R., 56, p. 319).

Most soils, no matter how productive, were found to respond profitably to some soil treatment at the 31 places where tested. In the livestock system every field responded profitably to manure. In the grain system the residue treatment brought a profitable response on all fields except the most productive one. Organic matter seems to be needed by practically all soils. Residues showed up best where legumes do well, while a ton of manure used alone was 60 per cent more valuable on light-colored than on the more fertile dark-colored soils.

Liming was found to improve production throughout the State. Dolomite and high calcium limestone gave about equal results. Light applications were found to give higher net acre returns, and no marked advantages were shown by fine limestone. The effect of limestone was found to disappear after 15 years.

A study on the effectiveness of rock phosphate under various conditions indicates little difference in the behavior of this fertilizer in dark- and light-colored soils, but it has proved about twice as effective in the grain system as in the livestock farming systems. Little difference between rock phosphate (plus gypsum) and acid phosphate was noted in continuous experiments in soil combinations during the years 1920-1926. Potash was found to increase the net returns from some soils, while there was little or no response to sulfur as a soil improver.

In comparative green manuring studies upon a number of different soil types, biennial sweet clover ranked first for spring plowing, followed by red clover, alsike clover, and alfalfa. For fall plowing sweet clover and red clover ranked high. Clipping sweet clover during the first year's growth (August 15 and September 15) markedly reduced the growth rate and acre content of nitrogen and mineral elements up to the time of plowing down as green manure the following spring.

The agricultural value of specially prepared blast furnace slag, J. W. WHITE and F. J. HOLBEN (*Pennsylvania Sta. Bul. 213 (1927)*, pp. 12, 13).—Applied on the basis of equal quantities of calcium oxide and in equally finely divided condition, blast furnace slag showed in pot tests the same crop-producing value as ground limestone. Granulated slag at the rate of 1 to 5 tons per acre was not equal to 1 ton of 20-mesh limestone for red or sweet clover production in the first year, and 1 ton per acre of granulated agricultural slag for corn, oats, and soy bean hay yielded about 75 per cent of the crop obtained by the use of 1 ton of 20-mesh ground limestone.

The relation of soil reaction to active aluminum, A. W. BLAIR and A. L. PRINCE (*Soil Sci.*, 24 (1927), No. 3, pp. 205-215, pl. 1).—From pot, cylinder, and field plat experiments made on the Sassafra loam and including a wide variety of acid and basic fertilizer and other treatments, it is concluded that with increasing amount of added acids and acid-forming materials there are concomitant increases in the H-ion concentration and in active aluminum, though with ammonium sulfate the pH drop was only slight. Basic materials and "acid" phosphate caused a concomitant decrease of active aluminum and rise of pH. Decrease in active aluminum content with increasing additions of lime and basic slag was found more rapid than with an increasing amount of "acid" phosphate. Indication was found that ammonium sulfate used in large amount or in moderate quantities over a period of years tends to increase the concentration of active aluminum in the soil. Used over a period of years and without lime, ammonium sulfate increased the H-ion concentration.

AGRICULTURAL BOTANY

Investigations on the nitrogenous metabolism of the higher plants, III-VII, A. C. CHIBNALL (*Biochem. Jour.*, 16 (1922), No. 5, pp. 599-610; 18 (1924), No. 2, pp. 387-407).—A continuation of reports previously noted (E. S. R., 52, p. 325).

From an investigation of the effect of low temperature drying on the nitrogenous bodies in the leaves of the runner bean, reported in part 3, it is claimed that protein autolysis takes place with increase in the simpler water-soluble nitrogen products, these products being chiefly ammonium salts, asparagine, and amino acids. The leaf proteins, though diminished in amount, are not appreciably changed in character. Proteolytic enzymes are present in the dried leaves and are activated by the addition of water. The presence of an asparaginase, activated by the addition of water, is indicated, and it seems to possess marked synthetic activity under the conditions of the present study. The position of ammonia and asparagine in the nitrogen metabolism of the leaf is discussed.

In a study of the distribution of nitrogen in the dead leaves of the runner bean, noted in part 4, tabular results show how very stable is the general equilibrium between the nitrogenous substances in the leaf during this period, the changes, even at death, being of a low order. There is no evidence of any considerable withdrawal of nitrogen from the leaves before death nor is there any accumulation of asparagine.

Briefly, there is no great withdrawal of nitrogen from the leaves to the stems or roots when the plant becomes aged. The protein- and protease-free water-soluble nitrogen shows a slight increase, due chiefly to ammonia and monoamino nitrogen, during the period of dehydration of the leaf on the plant. Toward the end of the plant's life the nitric nitrogen falls. The proteins in the leaf undergo slight amidization, a change which is ascribed to aging, since it was not observed in the proteins of leaves dried at low temperatures. The ratio of protein to nonprotein nitrogen in the leaf showed no appreciable change with age or death.

In part 5, reporting work on diurnal variations in the protein nitrogen of runner bean leaves, controlled experiments indicate that there is a definite fall in the protein content of bean leaves at night, due to the breaking down of the cytoplasmic material and to the translocation of nitrogenous products of this protein decomposition.

In part 6, on the rôle of asparagine in the metabolism of the mature plant, the decomposition products arising from protein metabolism in bean leaves are reported. These products consist in large part of asparagine and other substances of undetermined composition containing free amino nitrogen. The rôle of asparagine in the metabolism of the mature plant is discussed. It appears to be the chief agent whereby nitrogen in a form suitable for resynthesis of protein is conveyed from one part of the plant to another.

In part 7, partly reviewing the facts and data obtained, particularly during the years 1921 and 1922, it is stated as probable that under certain conditions, not yet known, the metabolism of the leaf proteins may vary. It is noted that in both cases when asparagine was not formed there was no production of pods.

Feeding plants manganese through the stomata, F. T. McLEAN (*Science*, 66 (1927), No. 1716, pp. 487-489).—An account is given of experiments by which chlorotic spinach plants were supplied with manganese through the soil, as well as introducing it into the tissues of other plants through the stomata of the leaves. Equally prompt and effective benefits were observed by both methods

of treatment, and it is concluded that the lime-induced chlorosis was cured by the action of the manganese within the body of the plant.

The method of injection of solutions into the leaf tissues through the stomata, it is believed, can be advantageously employed in studies of other plant diseases suspected to be due to deficiency of soluble substances.

The search for elements essential in only small amounts for plant growth, A. L. SOMMER (*Science*, 66 (1927), No. 1716, pp. 482-484).—The author summarizes some recent work that has been published on the requirements of plants for small quantities of various elements for their normal growth, and he calls attention to the necessity of exercising extreme care in experiments of this character that these elements from unknown sources are excluded.

The reaction of plant tissues, S. H. MARTIN, M. W. REA, and J. SMALL (*Brit. Assoc. Adv. Sci. Rpt.*, 94 (1926), p. 410).—Taking advantage of the fact that by using a series of indicators upon fresh-washed sections and noting colors rather than tints the reaction may be placed definitely within one of a series of ranges, a preliminary survey was made of 166 species (in most cases the young flowering stem). It was found that the tissue reactions vary in general between pH 6.0 and 4.0, and that certain tissues, as xylem and epidermis, tend to be more acid than others, as cortex. Tendencies toward higher or lower acidities are indicated in particular families or groups of families. Detailed studies of the reaction of all tissues of sunflower and of broad bean and from seed stage to anthesis indicate that while the reaction of some tissues remains constant that of others varies with the position above or below the soil surface, and with age. The buffer action in the sap from the hypocotyl of the sunflower is shown to be due to a very dilute solution of inorganic phosphates. Other results include the tissue reaction of selected stems for each month of the year and of the stems and leaves of a few species in a variety of habitats.

The relation between water content and photosynthesis, R. H. DASTUR (*Ann. Bot. [London]*, 39 (1925), No. 156, pp. 769-786, figs. 5).—A modification of apparatus involving a new type of leaf chamber, keeping the attached leaf and the plant under like constant conditions, has been devised and used under accurately controlled conditions. The results show that there is a distinct correlation between the decrease in the rate of assimilation and the fall in the water content per unit of leaf area, that leaves with low water content assimilate more rapidly than the leaves with high water content, and that the ratios between the decrease in assimilation and the decrease in the water content for different plants are different.

It is held that the decrease in assimilation may be due to the decrease in the water content caused by water shortage, and it is suggested that the conducting system is not able to supply water enough to meet the increasing demands. The inefficiency of the conducting system may be one of the internal limiting factors which terminate the life duration of leaves, and ultimately of plants.

Water translocation in young fruits, H. S. REED and E. T. BARTHOLOMEW (*Science*, 66 (1927), No. 1712, p. 382).—Studies of the fruits of lemons, walnuts, apples, tomatoes, and *Carissa grandiflora*, have shown that immature fruits are essentially masses of meristematic tissue. The cells are everywhere in contact with neighboring cells, without interruptions by intercellular spaces. Almost universally the cell walls contain pectic or related substances which possess marked inhibitory properties.

The purpose of this note is to call attention to the importance of the hydrophilic layers in the translocation of water through the tissues.

Studies of the physiological anatomy of the strawberry, P. R. WHITE (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 6, pp. 481-492, pls. 8, figs. 8).—

Some of the results are given of an anatomical study of the strawberry plant as represented by two varieties that are considered to have descended from crosses of *Fragaria chiloensis* and *F. virginiana*. The data presented are considered fundamental to an understanding of the growth and development of the plant.

Long-lived cells of the redwood, D. T. MACDOUGAL and G. M. SMITH (*Science*, 66 (1927), No. 1715, pp. 456, 457).—In a previous publication (E. S. R., 56, p. 516) McDougal reported the occurrence of medullary cells of the giant cactus that had remained alive for more than a century, and considered it probable that they had continued to enlarge during the latter half of that period.

Additional observations are reported in which cells of great age were found in the melon cactus and in the California redwood. In the redwood it was found that the ray cells may remain unchanged for a long time, and the authors observed ray-parenchyma with clearly defined protoplasts and apparently normal nuclei 70 layers deep in the heartwood. The ratio of length of life of these cells to that of their growing period is said to be the highest known. Full size is believed to be reached almost at once, or within a few days, and life may continue for a century or more. Attention is called to the fact that the known long-lived cells of plants are all of the simple parenchyma type.

The correlative inhibition of the growth of axillary buds, R. SNOW (*Ann. Bot. [London]*, 39 (1925), No. 156, pp. 841-859, figs. 4).—Inhibition is the term applied to the influence supposedly exerted by the main apex of a leguminous seedling upon the axillary buds. The varying influence of treatments is outlined. It is concluded that the inhibition of the axillaries can not be brought about simply by nutritive exhaustion, but that it must depend upon some conducted influence which originates at the growing apex. This conduction of inhibition is probably a process into which the movement of a soluble substance enters, at least at one stage, though it does not follow that the conduction consists simply in the movement of such a substance all the way.

Vegetative propagation, J. H. PRIESTLEY (*Brit. Assoc. Adv. Sci. Rpt.*, 94 (1926), p. 409).—In view of the importance and the uncertainty of vegetative propagation, particularly in some plant strains which have been produced by long-period selection and hybridization, a study of the process of vegetative propagation in the light of development and anatomy has been made; and importance attaches to the considerations indicated below. Roots and shoots differ in their mode of growth and in their nutrition under conditions of vegetative propagation; they originate in different tissues, and their production is differently affected by external conditions. The production of new roots and shoots in a monocotyledon is a very different problem from that presented by the dicotyledon, in which the new growing points arise in close association with the two cylinders of secondary meristematic tissues, the vascular cambium, and the cork phellogen.

It is suggested that no interpretation of vegetative propagation will prove practicable until a much wider knowledge is obtained of the processes governing the origin of meristematic tissue and its maintenance in healthy activity. From this standpoint the conditions governing the activity of the two cambial cylinders of the dicotyledon are briefly examined.

Soil sterilization and the normal root flora of wheat plants [trans. title], B. PRYORNEL (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 4, pp. 348-358, figs. 2).—In pursuance of accounts previously rendered, one of which is noted on page 340, details are given of the successful sterilization of soils for wheat.

GENETICS

Studies in the cytology of the Hibisceae. W. YOUNGMAN (*Ann. Bot. [London]*, 41 (1927), No. 164, pp. 755-778, pls. 3).—The cytology of microspore formation in *Thespesia populnea* is described, and its bearing on certain phenomena in *Gossypium* is discussed.

Cytological studies of certain meiotic stages in Oenothera. F. M. L. SHEFFIELD (*Ann. Bot. [London]*, 41 (1927), No. 164, pp. 779-816, pls. 3, figs. 3).—Certain stages in the meiotic divisions occurring in the pollen mother cells of *O. novaescotiae*, *O. eriensis*, *O. rubricalyx*, *O. ammophila*, and *O. agari* are described. In each of these forms the diploid chromosome number is 14. The genetical significance of the cytological events is discussed briefly.

A cytological study on pollen sterility in Solanum tuberosum L. I. STOW (*Japan. Jour. Bot.*, 3 (1927), No. 3, pp. 217-238, pl. 1, figs. 48).—Significant conclusions from this study have been noted from another source (*E. S. R.*, 56, p. 632).

Heritable characters of maize.—XXIX, Midcob color, M. DEMEREC (*Jour. Heredity*, 18 (1927), No. 9, pp. 420-422, fig. 1).—The twenty-ninth of this series (*E. S. R.*, 56, p. 518) reports on midcob color (*Md md*), a character in corn expressed by a colored ring around the pit or middle region of the cob. Light pink, red, carmine red, and dark sepia colors were observed in different families. Midcob color was found to be inherited as a simple Mendelian dominant to the noncolored condition and independently of cob color. It was not changed to brown by the recessive *a a* factor as in the case of cob color.

A trigeneric hybrid of Aegilops, Triticum, and Secale. C. E. LEIGHTY and W. J. SANDO (*Jour. Heredity*, 18 (1927), No. 10, pp. 432-442, figs. 5).—Two plants produced from kernels resulting from cross-pollinating the *F*₁ of *A. ventricosa* × *T. turgidum* with pollen of *S. cereale* were similar morphologically, both having pubescent peduncles, undoubtedly inherited from the rye, and were entirely sterile. Other characters from rye and also characters inherited from the wheat and Aegilops parents were present in the trigeneric hybrid plants.

Study of hairlessness now directed at causes (*Illinois Sta. Rpt.* 1927, p. 74).—In continuing the studies of the inheritance of hypotrichosis in rats (*E. S. R.*, 56, p. 225), by E. Roberts, matings between heterozygous individuals produced 848 haired and 267 hairless offspring, while matings of heterozygous and hairless individuals gave equal numbers of haired and hairless offspring. When hairless individuals were mated inter se only hairless offspring were produced. It has been found that this character segregates independently of color and albinism.

A few pigs produced by two boars and two sows of the so-called Mexican hairless breed indicated that the normal haired condition is dominant to the very sparsely haired condition of this breed.

Sex, inheritance, fertility. P. KAMMEER (*Geschlecht, Fortpflanzung, Fruchtbarkeit. Munich: Drei Masken Verlag*, 1927, pp. XII+280, pl. 1, figs. 30).—This book deals with the present knowledge of the inheritance of characters, including sex and fertility, and discusses other influences and their relation to the inheritance of acquired characters.

Reproduction in alcoholic mice.—I, Treated females: A study of the influence of alcohol on ovarian activity, prenatal mortality and sex ratio, E. C. MACDOWELL and E. M. LOEB (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ.*, 109 (1927), No. 4, pp. 549-583, figs. 13; *Ger. abs.*, pp. 579, 580).—In experiments in the department of genetics of the Carnegie Institution, at Cold Spring Harbor, N. Y., female mice were treated for 45 minutes daily with

alcohol fumes from weaning at approximately 4 weeks of age throughout the experiment. Data are recorded relating to the effect of such treatment on the reproductive processes, comparing litter-mate controls with the treated females. The number of ova shed was determined by making corpora lutea counts according to the operation previously described (E. S. R., 52, p. 631). The results of the study indicated that the length of the oestrous cycle, number of corpora lutea, size of litter, and prenatal and natal mortality were unaffected by the treatment, though the gestation period appeared to be slightly lengthened.

In a second experiment, females were given heavier alcoholic treatments by leaving them in the fumes for 5 days a week until they failed to respond when the bottle in which they were being treated was shaken. In one series of this experiment treatments were suspended between the operation for counting the corpora lutea, on about the twelfth to the eighteenth day of gestation, and parturition, but another group was treated daily during this interval.

The results showed that the length of the oestrous cycle was roughly doubled as a result of the treatment. First litters were delayed approximately 12 days, with a slight lengthening of the interval between successive litters which was attributed to a lengthening of the gestation period. The number of corpora lutea per pregnancy was slightly increased by the treatment, but was not generally affected by the two methods. The heavier treatment reduced the size of litter 12.3 per cent, and increased the proportion of young dead at birth by 4.5 per cent in the litters from dams receiving the suspended treatment and 9.4 per cent in the litters from dams which were treated continuously during the latter part of the gestation period. Approximately 5 per cent of all the litters born to control and treated dams produced no full term young. The proportion of such litters from treated dams was 0.89 per cent greater than for such litters from control dams. Among the young found dead at birth there were larger percentages of females than males in both groups, without indication of significant influence from the treatment. Prenatal mortality was increased by from 1 to 2 embryos per litter as a result of the alcoholic treatment, though the sex ratio at birth was not influenced nor was it related to the order of the litters. Certain abnormalities occurred in the young from both treated and control dams, but these could not be related in any way to the treatment.

FIELD CROPS

[Field crops experiments in Arkansas] (*Arkansas Sta. Bul.* 221 (1927), pp. 23-25, 48, 49, 51, 52-57, 57-62, figs. 3).—Variety tests with cotton, corn (E. S. R., 57, p. 629), wheat, oats, rye, barley, sorgo, grain sorghum, soy beans, cowpeas, alfalfa, sweet potatoes, and miscellaneous grasses and clovers; breeding work with cotton, corn, oats, wheat, and sweet potatoes; cultural and interplanting tests with corn (E. S. R., 57, p. 629); fertilizer and spacing tests with cotton; and size of seed piece trials with potatoes are described as heretofore (E. S. R., 56, p. 332).

Phosphorus was the only element which gave definite returns when used alone for potatoes. From 500 to 600 lbs. per acre of an 8-4-0 (P-N-K) or a 12-4-0 fertilizer gave the best results with a heavy soil, whereas a complete fertilizer such as 8-4-4, 10-4-4, or 10-6-4 seemed preferable on the lighter soils, applied in the drill at the same rates. Row application of fertilizers has been more economical than broadcasting. The rest period of freshly dug potatoes was successfully broken by treatment with ethylene chlorhydrin, or diluted lime sulfur, or by storage for 4 weeks at the ordinary temperature prevailing at harvesting time. However, the chemical treatments are not needed in central and

southern Arkansas. Fertilizers high in nitrogen and also peeling and cutting the seed before planting had a certain influence in hastening germination.

Sweet potatoes responded less to fertilizers than did other crops, phosphorus being the most important element. It was indicated that fertilizer for sweet potatoes should be supplied by the residue from fertilizing previous crops, such as potatoes. Where such land is not available, from 300 to 500 lbs. of 10-4-4 fertilizer is advised. Plants with large tops gave much better results than small plants, plants with small tops, or plants with clipped tops. Big Stem Jersey sweet potatoes kept somewhat better when the vines were removed 2 weeks before digging, whereas Triumph showed no such differences.

Red clover succeeded best on winter grain when sown on a late snow, while with spring-sown grain it did best seeded on the surface after the grain drill and without harrowing. Lespedeza was most successful on winter grains when seeded in early April on the surface without harrowing, and it did best on spring-sown oats when seeded on the surface after a light shower had packed the soil after the grain drill. Sweet clover sown on the surface after the grain drill made good stands, but the growth was usually a failure. Seedings of red clover, crimson clover, or sweet clover on winter grains in the fall were rarely successful, and only partial success was had in the seeding of other legumes on small grains. The effects of legumes upon succeeding crops and results in maintaining alfalfa stands were similar to previous findings.

Northern alfalfa strains, particularly Grimm, maintained stands and persisted longer than such southern types as Hairy Peruvian. Most northern types were found to have a heavy crown with branching roots, while southern sorts tended toward a long, tapering root with weak crowns. Grimm alfalfa appeared to surpass Hairy Peruvian in percentage of dry matter during the winter season and also in weight of roots per plant. The root reserve depletion of both varieties occurred from about November 15 and in the case of Grimm continued through the winter to April 1. Hairy Peruvian showed some fluctuations, doubtless due to resumption of growth in winter, whereas Grimm did not show such tendency. Successive warm and cool periods tended to kill the top growth of Hairy Peruvian and consequently reduced the root reserve.

Legumes planted in corn rows at corn planting reduced corn yields noticeably, although this was offset somewhat by forage production, whereas legumes planted in corn rows at the last cultivation made little growth and did not affect corn yields much. Corn with tillers removed early at Scott gave yields of 36.4 bu. per acre, removed late 34.9 bu., and with tillers undisturbed 39.6 bu.

Continuous pedigree selection during ten generations with cotton having seed with high and low oil and high and low protein contents showed that with an increase in protein there was a corresponding decrease in oil and with an increase in oil came a decrease in protein. The extreme divergence in the current analysis was evidently partly due to the potentialities existing in the original plants as well as the result of selection. Cooperative fertilizer experiments with cotton suggested that 400 lbs. of a standard mixed fertilizer is practical for average conditions in the State. Although nitrogen and phosphorus are most needed, a complete fertilizer is generally satisfactory and profitable. Building the cotton bed on the fertilizer generally gave better yields than when the fertilizer was applied after bedding. Formulas and rates of application for fertilizer were compared in three localities.

[Field crops experiments in Illinois] (*Illinois Sta. Rpt. 1927, pp. 46-51, 56-69, figs. 3*).—Varietal trials and breeding work with corn, wheat, oats, and barley, time of planting and seed harvesting tests with corn, and rotations are described as heretofore (*E. S. R., 56, p. 333*).

Corn from the 1926 crop of the high protein strain contained 18.17 per cent of protein as compared with 6.49 per cent for the low protein strain, and the high oil strain 10.21 per cent of oil and the low oil strain 1.43 per cent. The heights of ears of the high ear and the low ear strains were 108.8 and 11.4 in., respectively, and in the 2-ear strain 47.8 per cent of the stalks bore two or more ears. C. M. Woodworth and F. L. Winter observed that no relation was apparent between the yield of parent selfed corn lines and the yield of their hybrids. There also seemed to be no definite relation between pure line yields and a number of other agronomic characters studied, with the exception of ear length and yield. Open-pollinated and selfed Reid Yellow Dent germinated 99.5 and 97.1 per cent, respectively, had .061 and 18 per cent of abnormalities, and averaged 0.842 and 0.719 gm. in green weight per plant. E. E. DeTurk and E. G. Sieveking, cooperating with the U. S. Department of Agriculture, found that inbred strains differed in their response to potassium. Of two F_1 crosses surpassing an open-pollinated strain on untreated land, one made practically no increase for treatment, while the other made large gains, especially with potassium.

Seed corn picked when mature gave better stands than that picked in the glaze or at husking time. Drying studies with seed corn by E. W. Lehmann and R. C. Kelleher, cooperating with W. L. Burlison and G. H. Dungan, showed that a temperature of 190° F. was distinctly harmful, and it appeared that drying temperatures of 130 and 150° under the test conditions might be injurious to the vitality of corn. Keeping the drying temperature for seed corn 10° or more below 125° is suggested for best results in practice.

An extended survey of the quality of the 1925 wheat crop in central and southern Illinois was made by R. W. Stark. Laboratory studies showed that protein in Illinois hard red winter wheat from the Indianapolis and St. Louis markets averaged 11.34 per cent, soft red winter wheat 10.84, and mixed wheat 11.27 per cent, while the loaf volume of the three classes averaged about the same. Wheat obtained directly from growers in southern Illinois was practically all soft. Regional variation was observed in the protein content and in the loaf volume. The average protein content of hard wheats from central Illinois was only about 0.5 per cent greater than that from the soft wheats from southern Illinois, and their average loaf volume was less than that of the soft wheats.

Each of several varieties grown upon black clay loam soil contained considerably more protein and gave stronger flour than the same variety grown on grayish brown silt loam in Christian County, Ill. Protein in the wheat from the better soil averaged 13.19 per cent, and the loaf volume was 1,950 cc., while in wheat grown on the lighter soil 10.49 per cent and 1,778 cc. were obtained. Stark found little indication that any one of five certain varieties of wheat is better adapted to a particular soil type than is another variety, although there was some evidence of a regional adaptation.

Spring wheat grown on plats stripped of cornstalks had 31 per cent of infection with scab, while that grown where stalks remained had 38 per cent. The varieties differed markedly in degree of resistance to the disease, ranking in the order Illinois No. 1, White Australian, Progress, Kota, and Marquis. O. H. Sears found that clover chaff was more effective when used as a mulch than when plowed under ahead of the wheat crop, and the mulched wheat showed a higher test weight.

According to J. J. Pieper and W. P. Flint, northern-grown potatoes bought just before planting yielded 159.1 bu. an acre, northern-grown potatoes bought in the fall and stored at 40° 134.5 bu., and home-grown potatoes stored under

the same conditions 60.6 bu. The northern-grown yielded 54.7 bu. after being stored at 31° and 131.7 bu. after being held at 33°, while home-grown potatoes gave only a 10 per cent stand when stored at these low temperatures. Home-grown potatoes rotted much more than northern-grown potatoes under all storage temperatures.

[Agronomic experiments in Pennsylvania], D. E. HALEY, O. OLSON, C. F. NOLL, and F. D. GARDNER (*Pennsylvania Sta. Bul. 213 (1927)*, pp. 6, 10, 11, 13, fig. 1).—Analyses of plants of high nicotine strains of tobacco grown from seed from several foreign sources showed that the nicotine content of the web portion of the leaves varied from 2.69 to 10.09 per cent. The form of potassium used in a fertilizer mixture, while not modifying the quantity of this element absorbed by tobacco plants, was found to have a marked effect on the water-soluble alkalinity of the ash of the plant. On the whole, a relationship was apparent between the water-soluble alkalinity of the ash and the burning quality of the tobacco. Under moist conditions the plant possibly has a better opportunity to absorb basic potassium than during a relatively dry season. Where chlorine was present to any considerable extent within the plants the water-soluble alkalinity was quite low.

Field tests showed urea and ammonium nitrate to equal cottonseed meal as nitrogen sources for tobacco. Potassium chloride and manure salts produced large yields of tobacco, but the product had a bitter flavor and inferior combustion. Barnyard manure applied shortly before planting tobacco has resulted in poor quality. Artificial heat as an aid in curing tobacco has been effective in either completely preventing pole burn or in greatly reducing it. Heating the storage room to about 110° F. for 10 days and then reducing it to 90° increased the rate of fermentation, improved the quality of the product, and reduced the damage often caused by black rot and kindred diseases.

Leading soy bean varieties have included Hamilton, Elton, Manchuria, and Manchu for hay and Manchuria, Manchu, Ohio 7496, and Elton for seed, the results applying to central and northern Pennsylvania and the highest elevations farther south. A somewhat later variety is better for most of southern Pennsylvania. In a comparison of soy beans v. oats in a 4-year rotation, soy beans cut for hay yielded more than 2.5 times as much protein per acre as oats grain and straw and 12 per cent more net energy.

Plots similar in botanical composition and yields were plowed, seeded to oats, and later reseeded to a permanent pasture mixture. Six years later a series which had been limed and the nitrogen supplied in sodium nitrate contained about 40 per cent of Kentucky bluegrass, timothy 52 per cent, redtop 5, alsike clover 2.1, and yellow hawkweed 0.04 per cent, whereas on an unlimed series receiving ammonium sulfate the respective percentages were 2, 53, 22, 0.1, and 10.2

[Field crops] work of the United States Dry-Land Field Station, Ardmore, S. Dak., 1912 to 1925 (*U. S. Dept. Agr., Tech. Bul. 17 (1927)*, pp. 8-21, 25-32).—Cultural, variety, and rotation tests with different field crops are reported on for the period 1912-1925.

Spring wheat has shown a better average adaptation than winter wheat, out-yields barley, and is a more profitable market grain than oats, which gives similar yields. Corn has usually given fair yields of grain, has never failed to produce fodder, and has a certain place in rotations. Sorgho has also made good fodder yields. Conditions did not seem suitable for the profitable production of flax, red clover, sweet clover, or potatoes.

Since yields on fall plowing and spring plowing were similar, the choice would depend on such factors as timeliness of work, labor distribution, and power

required to prepare the land under different conditions. Three-inch plowing has generally yielded as much as 8-in. plowing. Subsoiling has not increased yields and has been ineffective in overcoming drought. Small grains have yielded about the same on disked as on plowed corn land, and even diskings might be dispensed with if the land is in good tilth. Listing was not wholly satisfactory for small grains or corn in this section.

The yields of sorgo have been about the same with alternate cropping and with fallowing, while other crops have made higher average yields on fallow than from continuous cropping, the greatest increase being with winter wheat. Fallow should be seeded to winter wheat in preference to other crops. Green manure has not increased the yields of spring-seeded crops over those on bare fallow, and it reduced the yield of winter wheat. Oats yields on sod were generally poorer than yields on old ground. Yields of small grains grown continuously fell off after the first few years in comparison with those of the same grains in rotation with other crops, whereas corn yields suffered no loss from continuous cropping. Small grains after corn or other cultivated crops yielded higher than after small grains. Although the yields on corn ground did not equal those on fallow, the preparation has been much cheaper. Corn, on the other hand, yielded nearly as well after small grain as after corn. A comparison indicated that under farm conditions in the locality the yields of wheat and oats on disked sorgo land may be expected to be as good as those on disked corn land.

Varietal trials of annual forage crops showed Dakota Amber sorgo and Northwestern Dent corn to be the best adapted for both dry feed and silage, and Dakota Kursk was the best of the millets. Sudan grass averaged about the same in yield as the best millets, but neither crop produced as much as Dakota Amber sorgo. Better yields of sorgo and Sudan grass may be expected in dry years from cultivated rows than from drilled plats. The merits of corn, sorgo, and sunflowers for silage are discussed briefly. While beets have been raised on a small acreage as a succulent feed for dairy cows, giving acre yields ranging from 5,000 to 25,000 lbs., root crops are not well adapted to the extensive system of farming practiced under dry farming conditions.

Small grain experiments, T. S. BUIE, W. B. ROGERS, and J. D. WARNER (*South Carolina Sta. Bul. 242* (1927), pp. 20, figs. 5).—Varietal leaders among the small grains included Fulghum and strains of Red Rust Proof oats, Abruzzi rye, Alabama Blue Stem, Boggs, Fulcaster, and Forty-to-One wheat, and Winter Bearded barley. Tennessee Beardless and certain selections of hooded and awnless barley also appeared promising.

Fertilizer trials, principally with oats, showed the small grains to be most responsive to nitrogenous fertilizer, with increases due to phosphorus and potassium on the lighter soil types. Benefits derived from increasing the application of complete fertilizer seemed largely due to the additional nitrogen. Small grains gave good response to readily available nitrogen applied early in the spring, especially with the heavier applications. The more commonly used sources of nitrogen did not differ greatly in their effects when applied in equivalent amounts early in the spring.

Spring seeding time for wheat, oats, barley, and flax in South Dakota, A. N. HUME, C. FRANZKE, and H. W. HARDIES (*South Dakota Sta. Bul. 227* (1927), pp. 12, figs. 3).—The results of seeding trials by the station and sub-stations since and including 1912 indicate the optimum seeding date for spring wheat to be March 15, durum wheat April 15, oats April 1 to May 1, barley April 15, and flax April 15.

Organic food reserves in relation to the growth of alfalfa and other perennial herbaceous plants, L. F. GRABER, N. T. NELSON, W. A. LUEKEL, and W. B. ALBERT (*Wisconsin Sta. Research Bul. 80 (1927), pp. 128, figs. 34*).—Field and laboratory studies of the organic constituents of the roots and tops of alfalfa (*Medicago sativa*) and several grasses, with their general behavior under varying cultural conditions are reported on, and applications of the findings to cultural practice with perennial hay and pasture plants are indicated.

Alfalfa growing in fertile soil was greatly reduced in vigor and productivity, weed infestations were increased, and both winter and summer mortality of alfalfa plants were more pronounced as results of frequent and early removals of top growth. With alfalfa seeded broadcast and in rows, in field plats, and individual plants transplanted in field plats, the quantity of root and top growth was closely correlated with the maturity of the top growth. Where top growth was removed often enough, succeeding growths decreased rapidly in vigor, a heavy summer mortality of the alfalfa plants occurred in the field, and the root growth of surviving plants was retarded. The amount of winter injury was generally correlated with the frequency of removal of top growth and the amount remaining uncut in fall and winter. Grimm alfalfa had a much higher degree of winter hardiness for all cutting treatments than did common alfalfa. Under favorable climatic conditions the dry weight of roots and of top growth increased most rapidly during the blossoming period. While yields of top growth of alfalfa for a short period may be larger with frequent and early cuttings, the fewer and more mature cuttings are inevitably far more productive. However, the sources of new top growth seemed to increase with the initiation of early cutting treatments.

Retardation of the growth of alfalfa plants and their ultimate death from cutting often and at immature stages appeared due primarily to the inability of the plants to photosynthesize enough organic food reserves to provide for adequate translocation to and storage of such reserves in the roots for future root and top development. New top growth is largely initiated at the expense of previously deposited root reserves, and unless replenished enough during the periods of successive cuttings a reduction in the root reserve occurs which progressively diminishes the amount of new top and root growth after each cutting to the point of extinction. The exact beginning of storage of organic food reserves in alfalfa roots was not observed, although such storage is greatly accelerated during blooming and seed formation. Slow growth, often noted in hardy alfalfa varieties and termed "fall dormancy," appeared also to be a period of some storage of food reserves. Later during fall dormancy, at least, part of the insoluble carbohydrates are converted into soluble forms, especially sugars. Some food reserves in the roots are lost during winter and before spring growth starts. Injurious effects were less pronounced and extended over a longer period where alfalfa was cut three or four times annually at the first blossoms instead of more often and earlier, but such losses in top growth yields were hastened by environmental factors.

The maturity and amount of top growth, amount of root growth, and longevity of alfalfa plants were usually associated with a high content of carbohydrate and nitrogen reserves in the roots. The percentage of many of the organic compounds in the roots and the total amount of each of the organic reserves in the roots were much greater with mature cuttings of top growth. Cutting alfalfa early and often, in contrast with mature cuttings, lowered the percentage and amount of dry matter, of total available carbohydrates, and of total nitrogen in the roots during the growing season so that pronounced differences occurred at winter dormancy. Susceptibility to winter injury was increased by low percentages of dry matter and low concentrations of carbo-

hydrate and nitrogen reserves in the roots at winter dormancy. In spite of large increases in the dry weight of top growth with maturity the percentage of total available carbohydrates therein remained fairly constant for all maturity stages. While the percentage of total nitrogen in the top growth was always higher with immaturity, much starch was seldom found in the tops, except a considerable percentage at maturity. The stems are for some time important storage organs.

Maturity of alfalfa, as indicated by blooming and seed formation, was associated with much higher percentages and quantities of total available carbohydrates, starch, dextrins and soluble straches, and of total sugars in the roots than in the tops, although such differences were small during vegetative stages and when immature top growth was periodically removed. The percentage of total nitrogen in top of immature plants exceeded that of the roots, while the situation was reversed with maturity. Stored foods in the roots of transplanted plants under favorable growing conditions in a dark room were utilized in the absence of photosynthesis to produce light yellow stems and leaves. Such growth ceased after several weeks, and the stored foods were reduced down to 3 to 5 per cent of the dry weight of the roots.

Timothy in mixture with alfalfa lacked growth vigor when cut three times as compared with two cuttings at later stages. After two years of frequent cuttings well established bluegrass sod produced less than one-fourth that of adjacent bluegrass cut once a year when mature. Redtop behaved similarly. The frequent and immature cutting reduced the rhizome and root growth of bluegrass and increased weed infestation, as compared with bluegrass cut at maturity.

Morphological characteristics of perennial herbaceous plants seemed to have an important bearing on the supply of reserve foods in relation to types of removals of immature top growth. After mowing, much of the basal leaves of many grasses remains and provides for the production and storage of enough reserve foods to sustain life of many plants, while with alfalfa similar cutting removes practically all the photosynthetic area of the plant, and the exhaustion of the stored foods is faster, often resulting in death. All the physical, chemical, and biological responses of the crop plants studied indicated the importance of organic compounds resulting from photosynthesis as limiting factors of growth for all perennial herbaceous plants.

Deposition and utilization of reserve foods in alfalfa plants, W. A. LEUKEL (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 7, pp. 596-623).—The work recorded in this paper has been essentially noted above.

Studies on the growth of alfalfa and some perennial grasses, W. B. ALBERT (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 7, pp. 624-654, figs. 3).—Essentially noted above.

[Experiments with legumes in Illinois] (*Illinois Sta. Rpt.* 1927, pp. 39-46).—Continued investigations (E. S. R., 56, p. 335) were concerned with the merits of alfalfa varieties and soy bean strains and varieties, seeding dates with soy beans, seed production in alsike clover, and a comparison of nurse crops for red clover.

No advantage was found by J. J. Pieper in seeding several alfalfa varieties in a mixture, and timothy was the only crop seeming to grow well with alfalfa. Timothy, red clover, and alsike clover surpassed any other combination for hay. Field peas with oats and winter vetch with oats were the highest yielding emergency forage mixtures, and a mixture of soy beans and Sudan grass led the late emergency forages.

That crops following early spring-plowed sweet clover yield as well as those on land where the sweet clover remained longer was shown again on both

light and dark colored soil by O. H. Sears, W. R. Paden, and F. M. Clark. Greenhouse results indicated that factors other than the accumulation of organic matter and nitrogen fixation are at least partly responsible for the beneficial effect of the sweet clover crop. Soils in which sweet clover was grown and from which the roots and tops were entirely removed were much better producers than soils left fallow. The mere growing of the crop seemed to increase the crop-producing power of this soil.

More evidence was obtained by C. M. Woodworth that selection for high or low lines within a soy bean variety was effective for even a chemical character such as oil content. It seemed that in general soy bean plants are pure for genetic factors responsible for high or low oil content, although certain plants are heterozygous for such factors. Low oil content appeared to be dominant to high.

Inoculation of soy beans to be seeded on land growing soy beans for the first time greatly increased the yield of the crop and the protein content of both hay and seed in studies by Sears. Sears and W. R. Carroll showed that certain, but not all, strains of cowpea nodule bacteria also produced nodules on the roots of the soy bean plant. Little difference was found by Sears and Paden in the yield of wheat after oats, potatoes, and uninoculated soy beans, although wheat after inoculated soy beans produced 2.3 bu. more than after uninoculated soy beans. Results in the greenhouse indicated that the value of soy bean inoculation upon the succeeding crop will be limited to a great extent by the fertility of the soils. With a low supply of available nitrogen, wheat after inoculated soy beans decidedly surpassed wheat following uninoculated soy beans, whereas on the more productive soils the yield differences were less.

Corn for North Dakota, P. J. OLSON, H. L. WALSTER, and T. H. HOPPER (*North Dakota Sta. Bul.* 207 (1927), pp. 106, figs. 36).—Presented as a handbook for corn growers and others interested in the crop, this publication discusses the relation of corn to environmental factors in the State, gives varietal recommendations for areas in the State from the results of extensive comparisons at the station and substations, describes important varieties, offers suggestions for the selection and preservation of seed, and outlines cultural and harvesting practices. Information is also given on the utilization, composition and feeding value of the crop, improvement, and corn judging and contests, and production statistics are appended.

Sagrain, W. E. AYRES and H. A. YORK (*Mississippi Sta. Circ.* 72 (1927), pp. 4).—Sagrain, a grain-producing sorghum with a sweet stalk, is described as a safe feed crop for conditions in the Delta region of Mississippi. Cultural directions are outlined briefly, and yields of the crop in mixtures are tabulated.

Fertilizer tests with flue-cured tobacco, E. G. MOSS, J. E. MCMURTREY, JR., W. M. LUNN, and J. M. CARR (*U. S. Dept. Agr., Tech. Bul.* 12 (1927), pp. 59, pls. 3, figs. 9).—Field tests with fertilizers used for growing flue-cured tobacco, assembled from different materials and varying in analyses and rates of application, were made in cooperation with the Virginia, North Carolina, and Georgia Coastal Plain (E. S. R., 57, p. 433) Stations, the North Carolina Department of Agriculture, and the Georgia College of Agriculture. The test localities as well as the soil types represented were fairly representative of the flue-cured tobacco districts. The soils were more or less deficient in plant food.

Phosphoric acid appeared to be an essential constituent of the fertilizer mixture on all soils of the district for tobacco production, especially on virgin soils. Acid phosphate gave better results than basic slag or raw bone meal as the source of phosphoric acid. On the lighter sandy soils mixtures with 6 per cent phosphoric acid gave as good yields and quality as the higher percentage mix-

tures when the application rate ranged from 800 to 1,000 lbs. per acre. At Tifton, Ga., the quality was somewhat better when the phosphoric acid content was increased. With phosphoric acid in excess there was a tendency to lower the yield and value of the crop, especially on the lighter soil types. Where the heavier soils were found, fertilizer with 8 per cent phosphoric acid surpassed mixtures with 6 per cent when the rates per acre were 1,400 and 1,600 lbs., respectively.

While the quantity of nitrogen needed for flue-cured tobacco varies with the season, soil, and source, the data indicated that as much as 30 to 40 lbs. per acre could be used and satisfactory yield and quality obtained. Nitrogen from any source gave yields and values exceeding those without nitrogen. Used over a period of years on the same soil without lime, sodium nitrate made average yields and values considerably better than those with ammonium sulfate, although the two salts were similar on a soil limed with ground dolomitic limestone. Dried blood gave good yields and quality except on soils deficient in magnesia, and even there when this deficiency was supplied by liming with ground dolomitic limestone. On soil deficient in magnesia cottonseed meal surpassed other nitrogen sources when no dolomite was applied. It usually gave good yields and quality on the light soils, exceeding results on the heavy soils. Stable manure produced satisfactory yield and quality of tobacco in tests at Tifton, Ga. The inorganic nitrogen sources were satisfactory when compared with the organic sources. Nitrogen derived from a mixture of sodium nitrate, ammonium sulfate, dried blood, and cottonseed meal usually gave better yields without decided difference in the quality of tobacco than from any of the materials as the sole nitrogen source.

Potassium seemed the most important single constituent of the tobacco fertilizer mixture from the viewpoint of quality. The growing plant exhibits characteristic symptoms when potassium is deficient, and when it is used at a liberal rate it serves to maintain the vigor of the plant. The test results indicated that over a period of years about 40 to 60 lbs. of potash per acre suffices in the combinations tested. Higher rates were observed to give greater resistance against leaf spot diseases in certain seasons, especially when weather conditions favored their development. Potassium chloride gave higher yields than potassium sulfate, but the margin was offset by the tendency toward poorer burn of the leaf. However, the results indicated that part of the potassium at the rates mentioned could be safely derived from potassium salts containing chlorine if the quantity of chlorine supplied is not more than from 20 to 25 lbs. per acre.

The proper rate at which a fertilizer of a given analysis should be applied for maximum yield and value seemed to vary considerably for different soils and conditions and therefore could be ascertained only within wide limits. With excessive rates there was a tendency to depress the quality of the leaf tobacco.

Deficiency of magnesia in the soil not provided for in the fertilizer mixture or by liming may result in reduced yields and lower quality of flue-cured tobacco. It can be supplied in certain potassium salts or by ground magnesian limestone. No great benefit was gained from liming except from the magnesia supplied. When the magnesia is derived from dolomite, only small quantities should be used to avoid possible harmful effects from root diseases and liberation of nitrogen which usually result when the soil is heavily limed for tobacco.

Comparative studies of winter hardiness in wheat, J. H. MARTIN (*Jour. Agr. Research* [U. S.], 35 (1927), No. 6, pp. 493-535, figs. 12).—Investigations carried on principally at the Minnesota Experiment Station were concerned with the most accurate and feasible methods for measuring winter hardiness in

wheat varieties and hybrids. The studies dealt with low temperatures and not killing caused by winter drought, soil blowing, heaving, or smothering by ice. Minhardi, Kanred, White Winter, and Marquis wheats were used in the experiments.

Hardy wheats were characterized by a low moisture content of the tissues, a high percentage of total solids in the juice, a high freezing point depression or osmotic concentration of the juice during active growth, a high percentage of bound water in the juice, a low rate of respiration at low temperatures, and often by a long period of vegetative growth. Ability to build up a high imbibition pressure of the cell colloids during hardening seemed to be the most important character influencing hardiness. Swedish (Minnesota No. 2) rye, more hardy than any wheat, possessed a high moisture content, a low percentage of total solids, and a low freezing point depression like nonhardy wheats, but it had a lower rate of respiration at low temperatures and a greater imbibition pressure than the hardest wheats.

A decrease in moisture content and increases in total solids in the sap, freezing point depression of the sap, and imbibition pressure of the cell colloids appeared to take place during the hardening of wheats. In the tissues of a given variety the quantity of juice expressed was found to be positively correlated with the moisture content. The percentage of total solids and the freezing point depression of the juice were negatively correlated with moisture content and the quantity of juice expressed from the tissues. The quantity of juice retained after pressing was positively correlated with moisture content in unfrozen tissues but not significantly so in frozen tissues. The moisture content, sap concentration, imbibition pressure, and hardiness of wheat and rye plants fluctuated widely during the fall and winter, and differences between varieties were not apparent at all times.

Sudden exposure of wheat and rye plants from the greenhouse to -10° C. ($+14^{\circ}$ F.) for 24 hours killed even the hardest varieties, whereas any variety of winter wheat could withstand -5° for the same period. Hardening seemed necessary to protect wheat against temperatures much lower than -10° which occur in northern wheat-growing areas. The ability to harden increases with the hardiness of the variety. Indications are that the crown is the hardest portion of the wheat plant above the soil surface, young leaves are harder than old leaves, and the bases of leaves are harder than the tips. While the genetic factors involved in the inheritance of hardiness have not been determined, most F_2 strains tended to be intermediate between the parents in hardiness.

Freezing of plants at controlled temperatures, followed by a determination of the extent of killing, appeared to be the most feasible laboratory method for measuring hardiness.

Spring wheat varieties for North Dakota, T. E. STOA, R. W. SMITH, and C. E. MANGELS (*North Dakota Sta. Bul.* 209 (1927), pp. 48, pls. 2, figs. 7).—Continued tests with spring wheat (*E. S. R.*, 45, p. 831) at the station and sub-stations dealt with comparative yields, choice of types and varieties, diseases, and the milling value and baking value of common wheat and the macaroni value of durum wheat varieties. The history and agronomic characteristics of new varieties are outlined briefly.

Good common wheat varieties seem preferable to durum in western North Dakota, whereas durums yield and grade better and are generally more profitable in the eastern part of the State. While Marquis common wheat has the widest adaptation, Kota is resistant to stem rust, may be seeded later, grades better, and usually produces grain with a higher protein content. Its

disadvantages are its weak straw, tendency to yellowish flour, and susceptibility to heat injury and loose smut. Ruby and Quality are early and may be grown on heavy land, although the latter is a white wheat and uncertain as to baking quality. Ceres (E. S. R., 56, p. 437) is a promising new variety. Mindum is outstanding among the durumms in most of eastern North Dakota, while for late seeding or in western North Dakota, Nodak may be grown to advantage. Monad and several of the rust-resistant durumms yield satisfactorily but are inferior for use in the production of macaroni products.

Dry-farming methods and practices in wheat growing in the Columbia and Snake River Basins, B. HUNTER (U. S. Dept. Agr., *Farmers' Bul.* 1545 (1927), pp. II+22, figs. 22).—Dry-farming methods used on grain farms in the Pacific Northwest where the annual rainfall is less than 15 to 18 in. are described, with discussion of the merits of summer fallow and ways to produce it on blowing and nonblowing soils. Suggestions are also made for the control of soil blowing, saving of man labor by the use of large power units, seeding of winter and spring wheat, and for maintaining the organic matter of the soil.

The seeds of quack grass and certain wheat grasses compared, H. H. HENRY (*Jour. Agr. Research* [U. S.], 35 (1927), No. 6, pp. 537-546, figs. 8).—According to this contribution from the U. S. D. A. Seed Laboratory, the individual seeds of *Agropyron repens*, *A. smithii*, and *A. tenerum*, with the exception of some terminal or immature seeds, can be identified as to species by a study of the characters, form, color, texture, concavity of palea, outline of palea tip, the shape of the rachilla segment, and the width of the opening between the edges of the lemma at the base of the rachilla. The shape of the rachilla and the width of the opening between the edges of the lemma at the base of the rachilla segment are valuable diagnostic characters for seeds of quack grass (*A. repens*). The seeds and significant characters are described and illustrated.

HORTICULTURE

[**Horticultural investigations at the Arkansas Station**] (*Arkansas Sta. Bul.* 221 (1927), pp. 15-23, 25, figs. 4).—Following the lines of work discussed in the preceding report (E. S. R., 56, p. 340), a study was made of the comparative pollinizing ability of several apple varieties when pollen was applied to the flowers of single clusters. Ben Davis was largely self-sterile but very satisfactory for Stayman Winesap. Yellow Transparent and Delicious proved to be excellent pollinizers for Ben Davis.

A study of individual spur performance failed to show that length, diameter, number of leaves, and total leaf area have any direct influence on fruit bud formation. In general spur performance paralleled that of the entire tree. The number of primary leaves per spur increased with the number of fruits, while the number of new leaves and the length of the current side growth decreased. In respect to the individual clusters, Stayman Winesap was observed to fruit largely on the central flower, which usually opened in advance of the laterals. In Ben Davis, a variety in which the flowers all opened about the same time, a large proportion of the clusters developed apples on both terminal and lateral blooms. Jonathan and Winesap bore largely on the lateral blooms. Fruit bud differentiation was detected in the apple as early as June 15 but not abundantly until later. Terminal growth ceased by the end of June in practically all varieties, but trunk diameter gain continued for 2 or 3 weeks later, a period believed to mark also the most rapid fruit bud differentiation.

No evidence was obtained in a young apple orchard conducted on the tillage cover crop basis to show that fertilizers had been of any benefit up to the fruiting age. Computed statistically, yields taken in a bearing apple orchard showed both nitrogen and phosphoric acid to have been beneficial and potash deleterious, probably because of the chlorine or magnesium present. Attempts to correlate terminal growth and trunk gain with yields of the subsequent season were not successful except where only the terminal growth around the outer circumference of the top was considered. A correlation was also recorded between foliage condition and the yield of the subsequent year. Fertilizers had no apparent effect on the color of apples except as they influenced growth and consequent shading. As determined by the pressure tester, no appreciable differences were detected in apples from the various fertilizer plats.

Nitrogen was outstanding in its beneficial effect on the growth and yield of peach trees. Phosphoric acid was apparently beneficial, but potash showed no effect on yields. Peaches receiving nitrogen ripened 2 or 3 days earlier but in many instances were less brightly colored, due to shading. No evidence was obtained to indicate that either phosphoric acid or potash affected color of peaches. Sugar tests and studies of chemical composition failed to show any effect of fertilizers. Some evidence was secured that changes in the proportion of the principal ingredients in chemical fertilizers may affect the keeping quality of peaches. A terminal growth ranging between from 3 to 10 in. was found more productive than longer or shorter lengths and may be best secured by judiciously combining fertilization, pruning, and tillage.

Contrary to earlier results, some evidence was obtained that phosphoric acid used alone or in combination with nitrogen was beneficial to grapes. Concord grapes summer pruned in varying degrees all showed injury, as measured in the quality of the fruit. Summer pruning retarded ripening and in severe cases decreased both the size and the number of the clusters. Observations on Concord vines injured by spring freezes showed that shoots arising from primary buds produced larger clusters and higher total yields than did secondary bud shoots. Primary double bud shoots were found more productive than primary singles, indicating that double buds are inherently stronger. None of the treatments had any appreciable effect on berry size.

On land on which cowpeas were grown the preceding year liberal applications of phosphorus more than doubled the yield of tomatoes, while nitrogen had no significant influence. Phosphoric acid apparently decreased cracking and decay but increased sun scald. The value of large, strong tomato plants for setting in the field was shown. Bonny Best proved valuable for early production and Marglobe for late production.

[Horticultural investigations at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 222-229, 235-239, 239-246, 247-263, figs. 6).—Of the many thousand apple and peach seedlings developed by C. S. Crandall in breeding investigations 533 and 238, respectively, have been propagated for further observation. Of the apples 34 were added during the year, and from the 238 peaches 15 were selected as particularly promising. Summer tipping of the central shoot of newly set apple trees again (E. S. R., 56, p. 342), proved successful in the forcing of lateral shoots where desired. Striking varietal differences were noted by W. A. Ruth and V. W. Kelley in the number of buds developed back of the cut. June was found to be a better time for tipping than later. A tendency was often noted for the buds immediately back of the cut to develop into shoots the succeeding season. Well distributed pruning accompanied by nitrogen fertilization was found by M. J. Dorsey and R. S. Marsh to promote uniform blooming and to impart vigor to 35-year-old Willow Twig apple trees.

Nitrate of soda at 9 lbs. per tree proved too liberal an application for Winesap trees, causing some reduction in color. Calcium cyanamide and sulfate of ammonia in heavier applications gave better color.

Again noting that tree variations in an experimental apple orchard at Olney were greater than those resulting from fertilizer treatments, Ruth found soil variability to be an important factor. Soil moisture determinations also showed great fluctuations, the content often dropping to a dangerous level in the root-containing layers. Pruning studies by Ruth and Kelley on 21-year-old Grimes and Jonathan trees at Urbana showed that in spite of the removal of two-thirds of the growing points the 1926 crop was not materially affected. Pruning had no influence on alternation of crops nor did it affect the proportion of growing points forming flowers. The growth of the trees measured in trunk circumference was not decreased. Moderate thinning of young Duchess and Wealthy trees induced the formation of bearing wood in the interior.

Studies by J. W. Lloyd and H. M. Newell of the apple marketing situation in Calhoun County showed the need of more uniform grading and packing and better transportation facilities.

As recorded by W. S. Brock, Winesap, Paragon, Ben Davis, and Winter Banana were found to be early bearing varieties of apples. Several varieties of sweet cherries bore satisfactory crops in 1926, and sour cherries gave good results. The pruning of 9-year-old sour cherries apparently increased yields but had no consistent effect on the size of the fruits. In tests conducted by A. S. Colby the Logan blackberry, the English walnut, and the papershell pecan failed to show any merit, but the Stabler and Thomas black walnuts and the Fuller and Boone chestnuts were found promising. Wet weather during ripening had a distinctly unfavorable effect on the keeping of grapes. Among black grapes Herbert is recommended for storage, and among reds Brighton, Delaware, Agawam, Caco, and Vergennes kept well. Gooseberry and raspberry breeding studies were continued. Contrary to results in the preceding, a very dry season, overhead irrigation failed to have any significant effect on strawberries. The Nanking cherry was found of promise as a combined ornamental and utility fruit plant.

Tests by Lloyd of various fertilizers as substitutes for stable manure in vegetable growing gave promising results. Vegetables which responded particularly well to phosphate and lime without manure were string beans, carrots, squash, and peppers; to complete fertilizer cabbage, celery, eggplant, beets, okra, endive, leeks, spinach, sweet potatoes, turnips, and kale. Yield records taken by Lloyd and E. P. Lewis in Cook County showed that phosphorus is the most important fertilizer for vegetables in this area, and invariably the yields were lowest when phosphorus was omitted from the formula. Corn and cabbage responded to the largest amounts of nitrogen used, but onions and cucumbers failed to do so. Lack of potash materially decreased onion yields and in all sized applications proved beneficial to all four crops. In the case of tomatoes, potatoes, and beans, a combination of 10 tons of manure and 800 lbs. of acid phosphate was more effective than 20 tons of manure or any other treatment. With the exception of beets, acid phosphate was distinctly more effective than rock phosphate. Nitrate of soda used alone was not beneficial except for beets. Strains of sweet corn, tomatoes, red cabbage, cucumbers, and beets conforming to the demand of the Chicago trade are in process of selection.

A gradual decline was noted by W. A. Huelsen and M. O. Gillis in the yield of Country Gentleman sweet corn strains isolated by the ear-row method. However, based on the ratio of cull to good ears, weight of single ears, and uniformity, some of the strains were distinctly superior to ordinary varieties.

A similar but slower falling off in yield was recorded in the Evergreen variety, but here again the selected strains were much more uniform than ordinary field types. In a rotation of 2 years of sweet corn, 1 year of winter wheat, and 1 year of red clover, a combination of phosphorus and potash proved the most beneficial fertilizer treatment.

Individual plant selections were made by Huelsen and Gillis from wilt-resistant tomato varieties with a view to improving yield, type, and resistance. In a greenhouse, the soil of which was inoculated with the wilt organism, wilt-resistant varieties outyielded Bonny Best in the autumn crop but in the spring only Marglobe surpassed this variety. Marvana was found to be the earliest of the wilt-resistant varieties. Wilt-resistant varieties were generally unable to set fruit abundantly during the cool, cloudy days of autumn.

Apparent increases of 22, 31, 54, 61, and 78 per cent were obtained by Lloyd from overhead irrigation of tomatoes, cabbage, celery, carrots, and onions, respectively. Studies, conducted by Lloyd and Newell on the cause of spoilage in various vegetables and fruits en route to market, showed the merit of careful harvesting and grading. The wrapping of individual tomatoes retarded ripening perceptibly.

Slight and rather insignificant differences in yield of flowers were obtained by F. F. Weinard for carnations grown on fresh as compared with old soil. No noticeable difference was observed in the keeping qualities of the flowers. In the case of roses slightly lower yields were obtained on old soil. Grafted Premier rose plants significantly outyielded own rooted plants, both in new and old soil. Stem length was quite uniform in all cases. Weinard and S. W. Decker found that gladiolus corms if allowed to remain in the greenhouse bench for about 6 weeks following cutting developed so satisfactorily that practically as good a crop was obtained the next season as was secured from similar sized bulbs taken from the field. January plantings were found superior to December in all cases. Records taken by Weinard upon strains of Hoosier Beauty, Ophelia, and White Killarney roses gave 21, 25, and 37 blooms for the high-yielding strains and 14, 20, and 37 for the low-yielding strains, respectively.

[Horticultural investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 213 (1927), pp. 6, 7, 8, 9, 16, 24-27, figs. 4).—The usual progress report (*E. S. R.*, 56, p. 138).

Conclusions reached by W. Thomas in a study of the nitrogenous metabolism of the apple tree (Stayman Winesap) are presented in detail. From a practical aspect nitrogen equilibrium was just about maintained by the application of 5 lbs. of sodium nitrate to a 15-year-old Stayman Winesap tree growing in sod. Various unclassified nitrogen compounds designated as "rest" nitrogen apparently had an important but unestablished rôle in metabolism.

In field studies conducted cooperatively by the departments of horticulture and agricultural economics it was observed that local topography counted much more in frost protection of apple orchards than did actual elevation above sea level. For example, a stream valley furnishing an unobstructed outlet for cold air gave good protection.

Observations by J. B. Hill upon *Digitalis* hybrids showed that reciprocal F_1 hybrids are generally alike and intermediate between the two parent species. Of various characters in the reciprocal F_1 hybrids cotyledon size and form were alone dissimilar and matroclinous. In crossing single and double flowered phlox extreme variability was noted by J. P. Kelly in the inheritance of petal number, making deductions of generalities quite impossible.

As reported by R. D. Anthony, the organic content of soils is highly important in orchards. Fertilizers increasing cover crop growth ultimately increase tree

growth and are especially important in sod orchards. Records taken by Anthony on the 1926 and 1927 blossom performance of Stayman Winesap trees planted in 1922 and 1923 in iron cylinders and receiving their first differential fertilizer treatments in 1925 showed that nitrogen alone or combined with phosphorus or potash or both apparently increased the percentage of bloom both in sod grown and in tilled trees.

Fruit storage studies conducted by L. M. Marble and Anthony emphasized the importance of controlling humidity and ventilation as well as temperature. Fruit held at 44° F. throughout the commercial storage period kept as well as that held at 36° for a considerable portion of the time.

As reported by F. N. Fagan, the disbudding of young apple trees proved a valuable means of establishing the proper framework.

As found by C. E. Myers, station selected Early Jersey Wakefield cabbage strains were superior in earliness, uniformity, and productivity to three of the best commercial strains. The superior strain of Early Jersey Wakefield was earlier and outyielded a selected stock of Golden Acre. Selected strains of Penn State Ballhead cabbage continued to show the superiority of this selection. Observations on Penn State Earliana, Matchum, and an improved strain of Nittany tomatoes emphasized the superior quality of these. Mendelian inheritance studies with tomatoes were continued, and four selected lots of rhubarb were found sufficiently promising to be distributed for wider testing.

M. T. Lewis was able by selection and breeding to improve the head characters in several lettuce varieties, and promising progeny was obtained from a cross of Golden Yellow Stonehead and Early Butternut. Determinations by W. B. Mack in various plats of a long continued fertilizer experiment following a prolonged spring drought showed considerably more soil moisture in the manured plats, which were also characterized by higher yields. No relation was found between fertilizer treatment and the solidity of the heads of cabbage.

Manure and electric hotbeds, H. L. GARVER and C. L. VINCENT (*Washington Col. Sta. Bul. 219 (1927), pp. 16, figs. 7*).—Comparisons between one-sash hotbeds heated by electricity and by the fermentation of animal manure showed the electrically heated bed to have certain advantages—namely, better heat control, easier operation, etc. In respect to costs, estimates over a 3-year period show but slight differences, though the initial cost of the electric bed is outstandingly higher. In respect to influence on plant growth (tomatoes and cauliflower) the beds were practically alike. The construction of both types is discussed in detail.

Grafting affinities, with special reference to plums, M. J. HEPPNER and R. D. McCALLUM (*California Sta. Bul. 438 (1927), pp. 20, figs. 7*).—Based on investigations and upon extended surveys in commercial orchards, herein are presented data upon stock and scion relations in the plum. European plums failed to thrive when grafted on Japanese varieties, but the reciprocal combination was generally successful. Frequent failure of California Blue either as stock or scion was noted. The peach proved to be a satisfactory stock for Japanese but not for European plums. Certain varieties of plums, including Apex, Duarte, Formosa, Clyman, French prune, Hungarian, President, Sugar, Tragedy, and Standard were successfully grafted on the almond. Attempts to use apricots as stocks for plum usually failed, whatever success being attained not being equal to that on other stocks. Peaches and almonds generally failed to grow well when grafted on plums. Clyman, Diamond, French prune, Giant, Sugar prune, and Tragedy were successful stocks for all other plums tested except the California Blue.

Diagnosing orchard ills, V. R. GARDNER, R. H. PETTIT, C. W. BENNETT, and W. C. DUTTON (*Michigan Sta. Spec. Bul. 164 (1927), pp. 70, pls. 8, figs. 81*).—Effectively and abundantly illustrated, partly in color, this bulletin contains in-

formation on the nature and the methods of control of various important physiological, pathological, and entomological troubles of the apple, pear, peach, plum, and cherry. A key is given to the more important disorders of the several fruits.

The Van Fleet raspberry in Tennessee, J. A. McCLINTOCK (*Tennessee Sta. Circ. 17* (1927), pp. 4, figs. 4).—The plant and fruit of the Van Fleet raspberry are briefly described in connection with notes on fruiting habits and potential value for home gardens.

Filbert culture, H. D. LOCKLIN (*Western Washington Sta. Pop. Bul. 6-W* (1927), pp. 32, figs. 9).—A general discussion of methods of culture, propagation, varieties and pollination requirements, pruning, pest control, and handling the crop.

FORESTRY

Forest research work in Finland, L. ILVESSALO (*Acta Forest. Fennica, 31* (1926), pp. 1-92).—A comprehensive discussion published with a view to acquainting the English reading public with the present status of forestry organization, forest research, and forest practice in Finland.

Shelter-belt investigations (*U. S. Dept. Agr., Tech. Bul. 17* (1927), pp. 32, 33).—Of several species, namely, laurel leaf willow, box elder, green ash, poplar, American elm, and caragana, planted in 1917 at Ardmore, S. Dak., as a shelter belt, three species, American elm, caragana, and green ash, alone proved sufficiently hardy to withstand the severe climate and unfavorable soil. Jack pine, Scotch pine, western yellow pine, and Black Hills spruce seedlings planted each year from 1917 to 1922 generally succumbed without making a start. Those few that grew made satisfactory development. Chinese elms planted in 1917 attained an average height of 15 ft. at the end of the sixth year. Too close planting proved unfavorable to the development of shelter-belt trees.

Timber growing and logging practice in the western white pine and larch-fir forests of the northern Rocky Mountains, E. KOCH and R. N. CUNNINGHAM (*U. S. Dept. Agr. Bul. 1494* (1927), pp. 38, pls. 10).—With an introduction by W. B. Greeley, as for the other members of this series (*E. S. R.*, 58, p. 40), this bulletin begins with a general discussion of the present condition of the forests and the status of forestry in the region covered and outlines in detail the various measures necessary to keep the forest lands productive. In the western white pine forests sufficient seed becomes buried in the duff to insure adequate restocking provided fires are excluded following cutting. Fire control measures and silvicultural practices are outlined for both western white pine and the larch-fir forests.

A corky-barked mutation of *Hevea brasiliensis*, H. H. BARTLETT (*Bot. Gaz.*, 84 (1927), No. 2, pp. 200-207, figs. 7).—The occurrence is herein recorded of a seed mutation of *H. brasiliensis*, found in the extensive plantations of the United States Rubber Company in Sumatra and differing from the ordinary species in having a thick, corky bark which gives the tree an entirely different appearance.

DISEASES OF PLANTS

Plant pathology (*Arkansas Sta. Bul. 221* (1927), pp. 25-29).—The work reported is largely in continuation of that in the previous report (*E. S. R.*, 56, p. 347).

Considerable attention was given to a study of problems connected with cotton wilt. Selection breeding experiments for wilt resistant strains of cotton were continued, and while some highly resistant ones were secured

they are not sufficiently early for Arkansas field conditions. Abandoning such susceptible varieties as Rowden and Express is recommended.

Further investigations have shown that there is little development of wilt in soil temperatures above 34° C. (93.2° F.), and that the cotton wilt organism is more tolerant to a range of soil temperatures than are various related species of *Fusarium*. As a by-product of this investigation it was found that soil temperature had a decided effect on the rate of germination of cottonseed and the emergence and growth of cotton plants during the seedling stage. Soil temperatures as high as 40° were found to promote rapid germination and emergence, although temperatures above 35° usually retarded growth. The extreme rapidity of germination and emergence at high temperatures is said to suggest the possibility of employing soil temperatures as a criterion for planting cotton to avoid slow germination and poor stand resulting from damping-off and seed decay.

In studies of the physiology of the wilt organism it was found that in the presence of inorganic nitrogen in the form of nitrate substances are produced which are toxic to the cotton plant, while in the presence of organic nitrogen the solution upon which the parasite had been grown has no harmful effect on cotton.

Studies were reported on the overwintering of the fire blight organism, *Bacillus amylovorus*. Anatomical studies with pear and apple showed that the bacteria invade mostly the cortex but occur also in the water-conducting tubes of the xylem, and the organisms were found considerable distances from the primary infection center and in some cases extending a foot below the margin of visible cankers. Inconclusive results were obtained in attempts to culture the bacteria from twigs and body cankers taken during the winter and early spring. Field observations were reported on the earliest signs of infections and their relationship to near-by cankers, using a number of pear and apple trees and particularly some planted near two severely infected Jonathan trees. The first infections noted in the spring were on the varieties Maiden Blush, Yellow Transparent, and Jonathan. Pear infections were rather few and were noted about seven days later than on near-by apple trees.

Additional data are given on studies of sweet potato mosaic, which are held to confirm results given in a previous publication (E. S. R., 56, p. 51). No mosaic appeared during the first season in which infection took place, and it is considered important that roots or slips should not be introduced from regions where the growing period of sweet potatoes is continued throughout the year. Roguing infected plants showing mosaic symptoms is suggested, and the roots of such plants should be rejected for propagating purposes.

In a study of degeneration diseases of potatoes, the yield of Bliss Triumph was increased by about 50 per cent by growing plants under wire screens which did not permit the entrance of leafhoppers. Heavy and thorough applications of Bordeaux mixture increased the yield in 1926 by 59 per cent.

Additional studies of the stem rot of rice are said to show that under certain cultural conditions the organism causing the disease dies out within a few months, whereas it is able to survive a year or more in the soil. Experimental work and observations are said to indicate the great importance of avoiding the spread of the stem-rot organism through soil, stubble, and possibly seed to disease-free sites.

Brief notes are given on a number of diseases of economic plants that have not been hitherto reported in Arkansas.

[Plant disease investigations at the Illinois Station] (*Illinois Sta. Rpt. 1927*, pp. 51-56, 230, 231, 232, 234, 239, 246, 247).—This continues work previously noted (E. S. R., 56, p. 348).

[*Corn ear rot investigations*].—Studies by B. Koehler, G. H. Dungan, and J. R. Holbert, in which more than 400 bu. of yellow dent corn of a medium-smooth, horny type were tested during the years 1924–1926 for the presence of ear rots due to *Fusarium moniliforme*, *Diplodia zeae*, and *Gibberella saubinetii*, are said to have shown losses due to these fungi of 8.63, 12.24, and 14.73 per cent in the respective crops.

To determine the time when the ears are most susceptible to infection inoculations were made with spore suspensions of each fungus on August 10, 20, and 30. The preliminary investigations are said to indicate that infection with all three fungi may take place through the silk without the husks being opened or the ear exposed. When the ear is exposed, however, the infection may take place more readily. Under the conditions prevailing during the test, inoculation on the silk or tip of the ear with *Gibberella* or *Fusarium* was most effective when made on August 10, and entirely ineffective when made on August 30. Inoculations made in a similar way with *D. zeae* were highly effective during the entire period. The studies are said to indicate also that *Diplodia* infection takes place readily through the shank of the ear, whereas infection with *Gibberella* or *Fusarium* does not take place so readily in this manner, and it is a question whether infection by these latter fungi occurs through the shank at all.

Dust treatments of seed corn for the control of diseases having shown somewhat more favorable results than liquid treatments, it is said that future experiments will be confined to the comparative value of dust fungicides. Investigations are reported showing that although dust treatments for seed corn make diseased corn yield more, such yields have never equaled those from first-class, nearly disease-free seed.

[*Blight control*].—Studies by H. W. Anderson of immune or disease resistant pear stocks have shown that a few pear trees of the Chinese species have gone through two bad blight years with no signs of disease. Selections of resistant pears of commercial quality were grown to test their resistance, and a number of them blighted badly during the season of 1926.

Blight hold-over cankers on Willow Twig apple trees in western Illinois were found to be highly destructive in 1926. Spraying with dormant strength lime sulfur, Scalecide, or oil emulsion had no effect on the bacteria in the cankers. An experiment was begun on cutting out of cankers on a 20-acre block of Willow Twig trees.

[*Blister canker control*].—A report is given of an experiment of H. W. Anderson on the control of blister canker through the cutting out of the cankers, coupled with orchard sanitation. This experiment has been in progress since 1919, and a satisfactory reduction in diseased trees has been observed from year to year.

Observations for two years on many orchards in the State are said to confirm the statements that the large majority of infections take place through ragged wounds which are produced by the breaking of branches overloaded with fruit. Such wounds should be carefully treated so that moisture can not collect upon them.

[*Control of peach bacterial spot*].—Peach bacterial spot is said to be one of the most baffling problems of peach growers in Illinois. Spraying and soil experiments by H. W. Anderson were continued, but no marked results were obtained with fertilizers. Spraying with sodium silicofluoride was found to control bacterial spot, although there was premature ripening of the fruit and some foliage injury. At present it is not considered wise for the commercial grower to use this material on a large scale. No other spray material was found to have any effect on the disease, with the possible exception of a colloidal sulfur compound.

[*Lime sulfur for the control of bramble anthracnose*].—Tests by A. S. Colby are said to indicate that lime sulfur is superior to Bordeaux mixture for the control of blackberry anthracnose.

[*Soil germicides for the control of crown gall*].—In experiments carried on by A. S. Colby varying amounts of sulfur, bleaching powder, limestone, and air-slaked lime were applied to soil in an attempt to control crown gall of raspberries. Nearly all the raspberry plants were killed unless the germicides were thoroughly mixed with the soil. Sulfur and bleaching powder seemed to be more fatal than limestone or air-slaked lime. The results as to crown gall control were conflicting, and no treatment appeared to be of especial promise. The variety Cuthbert seemed to be more susceptible to crown gall than King and Latham.

[*Copper dust for vegetable disease control*].—Experiments by J. W. Lloyd and E. P. Lewis with copper dust for the control of vegetable foliage diseases are said to have given results equal to those where liquid Bordeaux mixture was employed. The copper dust was composed of 16 lbs. of monohydrated copper sulfate, 64 lbs. of hydrated lime, and 20 lbs. of calcium arsenate. The Bordeaux was the common 4-6-50 mixture to which 2 lbs. of calcium arsenate was added to each 50 gal. of spray. Treatments with both fungicides gave good control of diseases of beans, tomatoes, and cucumbers.

Botany (*Pennsylvania Sta. Bul.* 213 (1927), pp. 14-16).—In continuation of the report of the work of this department for 1926 (E. S. R., 56, p. 144), brief notes are given of some of the leading investigations carried on during the year.

Investigations by J. B. Hill on the migration of *Bacillus amylovorus* in pear and quince tissues are said to show that the method was the same as that reported by Nixon (E. S. R., 58, p. 247), in which it was found that the migration of the bacteria is by the typical zoöglöeal strand through the intercellular spaces of the mesophyll tissue. When the bacteria reached the petiole of the leaf the path of migration was in the petiole cortex.

Additional investigations by F. D. Kern are said to indicate that the Fusarium wilt or stem rot of potatoes is notably severe on potatoes planted on corn stubble or wherever poor culture results in slow growth. It is suggested that rotations should be adopted in which potatoes follow a legume crop. It is claimed that where good seed, humus, and spraying are given the importance they demand, Fusarium wilt becomes a minor factor.

In a study of potato seed source H. W. Thurston, jr., and C. F. Noll report upon the rapidity with which potatoes succumb to degeneration diseases on the limestone soils at State College. It is believed that importing disease-free seed at least every other year is important for a large portion of the State.

In continuation of a study of diseases of truck crops caused by *Sclerotinia* and *Botrytis*, W. S. Beach found negative results from the use of fertilizers to control *Botrytis*, and it is believed that an abundance of soluble salts in the soil is apt to injure the roots and increase susceptibility to attack. Further experiments with mercury compounds showed no control of *Botrytis* when used on lettuce in amounts that did not injure the crop.

Studies by Beach are reported on the progress and parasitic relations of *Bacterium vignae* and *B. viridifaciens* inoculated on the leaves and pods of Lima beans. In the leaves, the first rapid spread of the bacteria was found to take place through the large intercellular spaces of the mesophyll, while in the pods the first rapid spread was between cortical cells from the epidermis to a depth of from 10 to 15 cells where the intercellular spaces are large.

Further experiments by Beach on the diseases of mushrooms have shown that sprinkling the soil prior to casing with a 1-25 formaldehyde solution is of practical value in controlling the disease due to *Mycogone perniciosa*. The

treatment of the surface of the soil with various disinfectants was not effective in controlling the disease, and such treatment often damaged the crop. In treating casing soil with mercury compounds prior to casing, it was found impossible to determine a proportion that would reduce disease and not injure the crop. Some check experiments are believed to indicate that sulfur fumigation of mushroom houses might be effective against the fungus.

Anticryptogamic action of chemical fertilizers [trans. title], B. PEYRONEL (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 138-144).—A discussion, principally of the effects of calcium cyanamide on plant parasites, and specifically of wheat seed treatments, shows practically a controlling influence of this chemical on seed-borne fungi when used at a concentration of 0.1 per cent. At 0.01 per cent the microorganisms under the treatment were more numerous than in the untreated controls. At 1 per cent no organisms developed. Germinability was but slightly reduced by the effective concentrations.

Toxic action of calcium cyanamide on *Blepharospora cambivora* and *Pythiacystis citrophthora* [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 135-138).—The effects on *B. cambivora* and *P. citrophthora* of calcium cyanamide over a range of from 0.05 to 0.2 per cent are given. A concentration of 0.1 per cent impeded mycelial development of both *B. cambivora* and *P. citrophthora*. At 0.2 per cent *B. cambivora* did not undergo complete development, and even at 0.15 per cent the effect was decidedly toxic. At 0.05 per cent the dosage was not toxic but furnished available (utilizable) nitrogen, and when a solution of mineral salts was provided *P. citrophthora* formed numerous sporangia, though *B. cambivora* remained sterile at that concentration.

Lack of oxygen in soil in relation to root rot, J. W. M. Roodenburg (*Zuurstofgebrek in den Grond in Verband met Wortelrot. Proefschr., Rijks-Univ., Utrecht, 1927*, pp. X+103+1, pls. 3, figs. 23).—In this University of Utrecht thesis general conclusions are detailed regarding the characters of root rot, parasites, resistance, and the significance of aeration.

Cereal foot rot [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 174-178).—One of the properties of cereals susceptible to attack by the foot-rot organism *Leptosphaeria herpotrichoides*, and probably also those attacked by *Ophthobolus* sp., is a subnormal pH value in the tissues.

The Rhizoctonia and Olpidium disease of cauliflower seedlings [trans. title], J. H. H. VAN DER MEER (*Tijdschr. Plantenziekten*, 32 (1926), No. 8, pp. 209-242, pls. 2, figs. 5; *Eng. abs.*, pp. 235-240).—In May, 1925, a disease of cauliflower was found to check growth in the transplanted seedlings, the root system developing poorly at first, though the plants recovered and were marketed with only minor loss.

Among the lateral roots, some were yellowish brown and showed sporangia and resting spores of Olpidium. This fungus appeared on 11 out of 13 of the diseased plants, while 5 showed a Rhizoctonia. Both affected the development of cauliflower. Observational and experimental data are presented.

Observations on clover anthracnose [trans. title], S. J. WELLENSIEK (*Tijdschr. Plantenziekten*, 32 (1926), No. 10, pp. 265-302, pls. 4; *Eng. abs.*, pp. 295-298).—Anthracnose of red clover (the most important forage crop in the Netherlands) is dealt with as a whole; the hibernation of the fungus, the transmission of the disease by the seed, and the susceptibility of different clovers in somewhat greater detail. *Gloeosporium caulivorum* and *Colletotrichum trifolii* are said to differ widely as to characteristics in culture and especially in behavior toward different clovers.

Notes on the soft rot of cotton bolls in the West Indies caused by *Phytophthora*, J. C. HOPKINS (*Ann. Bot. [London]*, 39 (1925), No. 154, pp.

267-280, figs. 17).—Cotton boll soft rot in the West Indies may be due to at least two species of *Phytophthora*, one of these apparently having two strains. Degrees of virulence have been ascertained for these fungi, and their relative susceptibility or resistance is indicated. The forms indicated excrete a cellulose-dissolving enzyme which can cause a rot and cell separation in the absence of the fungus mycelium from the host tissue. The rot resulting from growth of the fungus in the tissue and that due to enzymes are compared. The possibility of control by spraying with Bordeaux mixture is indicated.

Indications of the transmission of an acquired character in flax, H. L. BOLLEY (*Science*, 66 (1927), No. 1709, pp. 301, 302).—Citing his work on the development of strains of wilt-resistant flax, the author states that he has been able, through constantly submitting nonresistant varieties of flax to increasing degrees of disease, to bring about a high degree of immunity to attack by *Fusarium lini* without any associated evidence of cross-fertilization. When the strains which have accumulated a certain degree of resistance to a fungus attack are crossed artificially upon nonresistant strains, they are said to transmit a definite degree of immunity to the resulting progeny. It is claimed that wilt resistance may be accumulated rather rapidly, and that when it is thus accumulated it is transmitted from generation to generation through the seed; and that when once obtained to a certain degree it can be fixed through artificial crossing.

Tumors in kale, P. N. ANNAND (*Science*, 65 (1927), No. 1692, pp. 553, 554).—The author reports experiments in the artificial production of tumors in kale in which the entire plant was subjected to vapors, localized portions of leaves subjected to vapor, and stimulation by injections made with hard glass needles. The first two methods produced only small warty intumescences. The vapors of ammonia, ethyl alcohol, and acetic acid increased to a considerable degree the number of intumescences but did not definitely increase their size. In the third method, solutions of common salt, ethyl alcohol, calcium chloride, acetone, glycerin, cane sugar, paraffin oil, distilled water, and extract of kale resulted in the formation of small tumors. Both hyperplasia and hypertrophy occurred with a disappearance of the chlorophyll from the tumor tissue. There was not only a proliferation of parenchymatous tissue, but in many cases the phloem became involved.

While the ability of such a variety of materials to induce tumor formation is said to leave the causative factor in kale in doubt, it is claimed that apparently any wound accompanied by a liquid injection is sufficient stimulus where other conditions are favorable to bring about the proliferation of tissues. Tumors of large size were produced only during the spring rainy season, when there was abundant rainfall, minimum daily sunlight, and humid atmosphere. Small or no tumors were produced during the dry season.

Isolation of *Blepharospora* from lupines [trans. title], B. PEYRONEL (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 160, 161).—The author has been able to isolate and culture and to study more accurately the *Blepharospora* previously noted as attacking lupines (E. S. R., 46, p. 241), from which losses are said to occur every year due to this cause.

Alternaria tuber rot of potatoes, L. O. GRATZ and R. BONDE (*Phytopathology*, 16 (1926), No. 1, p. 68; also in *Maine Sta. Bul.* 335 (1926), p. 287).—A brief account is given of experiments in which potato tubers were stirred with foliage spotted with early blight (*A. solani*). Infection resulted when the tubers were inoculated and stored under either moist or dry conditions, the latter producing the most typical lesions. High percentages of infection were obtained under all conditions, but the best results were secured by inoculating

moist tubers and drying them before storing. Infection occurred on half-grown tubers and throughout the season until after digging time, but there was practically none found on tubers inoculated 20 days after digging. Bruising was an aid, but not essential to infection. The most typical lesions are said to have developed when the tubers were not bruised.

The relation between the weather conditions and the occurrence of potato blight (*Phytophthora infestans*) [trans. title], E. VAN EVERDINGEN (*Tijdschr. Plantenziekten*, 32 (1926), No. 5, pp. 129-140; *Eng. abs.*, pp. 139, 140).—In a critical discussion of the report by Löhuis (E. S. R., 57, p. 545), the present author emphasizes the occurrence of dew during the night. He indicates as favoring potato blight outbreak its occurrence during at least 4 hours of the night, a minimum temperature above 10° C. (50° F.), a mean cloudiness during the next day above 0.8, and a measurable rainfall during the next 24 hours.

The rusty spot disease of potato tubers in the Dutch East Indies [trans. title], M. B. SCHWARZ (*Tijdschr. Plantenziekten*, 32 (1926), No. 12, pp. 321-330, pl. 1; *Eng. abs.*, pp. 327-329).—Following up the article by Quanjèr (E. S. R., 57, p. 350), the present author gives a descriptive account in Dutch and briefly in English of this disease. It seems to occur especially in large tubers (35 gm. and more) of white varieties as a central, diffuse, rusty discoloration, generally beginning at the basal end and showing characteristic rusty spots in the discolored region.

The rusty spot disease is most distinct in freshly dug tubers. The cells in the spots show a brown suberin-like substance surrounded by a cork cambium. The disease is important in several regions mentioned. It seems to occur on soil having a low lime content, and lime manuring has been successful in the control of the disease in some cases. The use of stable manure increases the percentage of spotted tubers. The cause of rusty spot has not been ascertained. A comparative tabular showing is made between sprain, net-necrosis, and rusty spot disease.

Although the symptoms of the European sprain and the East Indian rusty spot disease do not quite agree, they resemble each other so much in some respects that both diseases are considered to belong to the same group, for which the name rusty spot disease is retained.

Transmission of potato witches' broom to tomatoes and potatoes, P. A. YOUNG (*Science*, 66 (1927), No. 1709, pp. 304-306).—In this preliminary report, tomato plants inarch grafted to stems of infected potatoes are said to have shown symptoms of disease within 53 days. This is believed to be the first report of the transmission of the virus of potato witches'-broom to a different host.

Experiments were carried on with a considerable number of varieties of potatoes to determine the method of transmission, as well as the susceptibility of varieties to the disease. Tuber plug inoculations produced the disease in a number of varieties, but failed to do so with others. Mealy bugs and leaf mutilation inoculations failed to produce symptoms of the disease.

Crops naturally infected with sugar beet curly-top, H. H. P. SEVERIN (*Science*, 66 (1927), No. 1701, pp. 137, 138).—The author states that when a severe outbreak of sugar beet curly top occurs other crops are liable to be seriously damaged. A study was made of possible host plants of the infective principle of curly top by allowing noninfective leafhoppers to feed on diseased plants, after which they were transferred to sugar beets. If curly top developed, it was assumed that the original plants were infected with the disease. By this means the author found 15 genera, represented by 26 species and varieties of plants, to be naturally infected. These were distributed among the

families Chenopodiaceae, Leguminosae, Cucurbitaceae, Solanaceae, Cruciferae, and Umbelliferae.

The development of more effective dust fungicides by adding oxidizing agents to sulphur, H. A. LEE and J. P. MARTIN (*Science*, 66 (1927), No. 1703, p. 178).—Investigations are said to have shown that sulfur oxidized by the addition of 0.25 per cent nitric acid and of 1 per cent potassium permanganate reduced the eyespot disease of sugar cane caused by *Helminthosporium sacchari* by 89.9 per cent as compared with a reduction of but 9 per cent where finely divided sulfur was employed. Sulfur to which was added 0.25 per cent nitric acid reduced the disease by 61 per cent. The effectiveness of oxidized sulfur was augmented by further increasing the concentration of potassium permanganate to 5 per cent. No burning of foliage occurred, even when 10 per cent potassium permanganate was used.

Bed rot of sweet potatoes, B. B. HIGGINS (*Georgia Sta. Circ.* 80 (1927), pp. 218-221, fig. 1).—A brief popular account is given of a rot of bedded sweet potatoes caused by *Sclerotium rolfsii*.

Studies on some forms of grapevine disease, L. RIVES (*Recherches sur Quelques Formes de Dépérissements de la Vigne*. Toulouse: Impr. Régionale, 1926, pp. 103, figs. 14).—The several chapters of this book deal with endotrophic mycorrhiza, *Fusarium viticolum* in grafts, esca, and death in case of graft hybrids.

Grape sclerosis [trans. title], P. VIALA and P. MARSAIS (*Compt. Rend. Acad. Sci. [Paris]*, 184 (1927), No. 25, pp. 1504-1506).—A descriptive account is given of what is claimed to be a new disease of grapes due to *Sordaria uvicola* n. sp. The grapes at maturity break up superficially, rapidly dry out, and show the scleroidal bodies which suggest for this disease the name sclerosis.

Effect of sulfuric anhydride on grapevines [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 4, pp. 385-389, figs. 3).—The supposed action of sulfur dioxide in the production of grapevine leaf scorch and other tissue anomalies is described.

Some Peronosporaceae causing alterations in lemon fruits [trans. title]. B. PEYRONEL (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 2, pp. 171-173).—Observations during 1921-1925 are outlined as regards several fungi causing injury, principally to lemon fruits.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Beaver habits and experiments in beaver culture, V. BAILEY (*U. S. Dept. Agr., Tech. Bul.* 21 (1927), pp. 40, pls. 14, figs. 7).—This bulletin supersedes Department Bulletin 1078, previously noted (*E. S. R.*, 48, p. 250).

Mink raising, F. G. ASHBROOK (*U. S. Dept. Agr. Leaflet* 8 (1927), pp. [2]+6, figs. 5).—This is a practical account of mink raising, in which it is pointed out that further experiment will be required before it can be determined whether raising these animals in captivity as fur producers can be made profitable.

The magpie in relation to agriculture, E. R. KALMBACH (*U. S. Dept. Agr., Tech. Bul.* 24 (1927), pp. 30, figs. 11).—This account deals with the distribution of the common black-billed magpie (*Pica pica hudsonia*), its life history, food habits, and control measures. A brief account of the yellow-billed magpie (*P. nuttalli*) is included (p. 28).

The common magpie, which is a characteristic bird of the plains and mountains of the West, exerts an economic influence not greatly different from that of the crow of the East. Study of its food habits indicates that as an insect eater it surpasses the crow and, as far as is now known, has no superior in this respect among the North American Corvidae, a family which includes the

jays, crows, and magpies. Destructive weevils, caterpillars, and grasshoppers characterize its insect food, which forms nearly 36 per cent of its annual diet. The magpie also must be credited with the destruction of a certain though limited number of small rodents, and as a carrion feeder it also does some good. On the other hand, the magpie is guilty of the destruction of poultry and beneficial wild birds and their eggs; it has at times become a pest on the cattle ranch by its attacks on sick, injured, or weak livestock; and has proved a nuisance and hindrance in campaigns against coyotes by feeding on baits or tripping traps set for these animals.

There are times when these birds become so bold or gather in such great numbers that their faults become emphasized to the degree that a reduction in their numbers in local areas is warranted. Poisoning during the winter has been found to be an economical, effective, and safe method of accomplishing this. The present study has revealed, however, that there are times when its influence may even be decidedly beneficial. Consequently, extirpation of the bird over large areas is not called for, and before local campaigns of control are inaugurated careful consideration should be given to their necessity and scope.

The yellow-billed magpie, confined to a small area in California, has habits similar to those of the common species, but its limited numbers obviate the necessity of control at the present time.

[Papers on economic entomology] (*Iowa State Hort. Soc. Rpt.*, 60 (1925), pp. 94-102, 306-324, figs. 2).—The papers here presented include the following: Oil Emulsion Sprays: Their Place, Manufacture, and Use, by T. J. Talbert (pp. 94-102); Spray Poison in Colorado, by R. G. Richmond (pp. 306-308); The Spread of the Bee Moth, by F. B. Paddock (pp. 308-312); American Foulbrood, by S. M. Farr (pp. 312-318); What is Foulbrood Doing for Us? by J. G. Jessup (pp. 318-320); Disease Immunity in Bees, by J. M. Bixler (pp. 320, 321); and the Scourge of Beekeeping, by R. L. Parker (pp. 322-324).

[Report of entomological work at the Arkansas Station] (*Arkansas Sta. Bul.* 221 (1927), pp. 34-37, fig. 1).—In work with the boll weevil the relation of color and size of leaf surface to its abundance was studied in a series of experiments carried on in 1925 and 1926. For contrasting leaf color, the variety Winesap, with a dark red foliage, was planted in alternating plats with Acala, a green-leaved variety. In both years the plats were infested with an equal number of newly emerged weevils within 3 weeks to 1 month after the beginning of setting of the squares. Within 10 days the majority of the weevils migrated to the green-leaved cotton. After the weevils became crowded for food on green-leaved cotton the red-leaved cotton became heavily infested also. Similar experiments conducted with large-leaved and small-leaved varieties failed to show any preference for either when the plants were equally luxuriant.

In control experiments with the striped cucumber beetle, an account of which by Isely has been noted (*E. S. R.*, 57, p. 63), both sodium and calcium fluosilicate gave good results, the former having a somewhat quicker action, and they are recommended for use in combating this pest.

Brief notes are given on three shade tree pests, the bagworm, walnut caterpillar, and fall webworm. In work with horseflies, four species were found to be more important than the others, namely, the black horsefly, striped horsefly, *Tabanus costalis* Wied., and *T. sulcifrons* Macq.

[Entomological work at the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 213 (1927), pp. 31-33).—Investigational work by S. W. Frost with baits for the control of the oriental fruit moth indicates that they are of practical value. Orchard tests on peach during the summer of 1926 showed a reduc-

tion of 80 per cent where the percentage of oriental fruit moth was 50 per cent. High-grade molasses and sugar-bearing sirups were found more attractive than low-grade molasses. Brown and granulated sugars were very good bait, but were not practical because they attracted a large number of honeybees.

Calcium cyanide broadcast over cold frames infested with millipedes was found by C. A. Thomas to give a 98 per cent kill in the treated strip and not to injure the lettuce when the seed was planted 2 weeks after treatment. All the seed was killed, however, when planted in the strip only 5 days after the treatment. Pyrethrum powder and a proprietary substance did not injure the seed planted in these plats 5 days after treatment, but gave no control of the millipedes.

Life history and control studies were made by Thomas of the *Sciara* and *Phora* flies and the mites injuring cultivated mushrooms. It was found that, if the manure reaches a temperature of 135° F. after being placed in the house, practically all the mites and insects in it will be driven to the surface and killed, this being especially important in the lower beds. Fumigation during the heating period with calcium cyanide (0.5 to 1 lb. per 1,000 cu. ft.) kills the flies and larvae which may escape the heat or get into the aisles, but the hydrocyanic acid gas will not penetrate into the moist manure to kill the insects below the surface. After heating, the flies should be kept out of the house by screening and all crop remnants, stems, etc., should be destroyed by burning. The use of the light kerosene pan trap, beginning when the manure starts to cool, will catch many of the first flies coming into the house. Nicotine solutions, sprayed on the bed immediately after picking and repeated, gave good control of fly larvae in a heavily infested bed. Nicotine solutions and nicotine 2 per cent dusts were not effective against mites, either when applied in the manure or applied directly to the patches of hyphal occurring on the casing soil. A cresol sheep dip was much the most effective of a number of chemicals tried against these hyphal. Preliminary experiments on materials placed in the manure just before it was placed in the house indicated that paradichlorobenzene killed most of the mites but retarded the subsequent growth of the mushrooms. Hellebore and borax powders gave no control of mites, and the borax entirely prevented a growth of mushrooms on the bays treated with it. Carbon disulfide emulsion gave only a small percentage of control when applied in the manure or on the surface of the beds before heating.

In field and laboratory studies by Thomas of wireworms affecting truck crops, several species were reared from larvae to adult stages. Control experiments, consisting chiefly of a check-up of the results obtained the preceding year, again showed the value of drilling in granular calcium cyanide after a bait. All attempts to control wireworms feeding on the roots of growing cabbage, cauliflower, kohlrabi, radishes, and lettuce, by drilling granular calcium cyanide into the soil close to the plants, resulted in injury or death of the plant and did not always kill the wireworms.

Status and distribution of several imported insect pests in Pennsylvania, C. H. HADLEY (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 705-708).—This is a brief account of the several major imported insects recently found in Pennsylvania, including the Japanese beetle, the European corn borer, the Mexican bean beetle, and the oriental fruit moth (*Laspeyresia molesta* Busck). Each of these species is apparently slowly spreading and increasing in economic importance. Two other species, the imported willow leaf beetle (*Plagiodera versicolora* Laich) and the apple and thorn skeletonizer (*Hemerophila pariana* Clerck), have both been found but have not as yet become of great economic importance.

[Report of the] entomological branch [of Canada] (*Canada Min. Agr. Rpt., 1925-26, pp. 95-111*).—The work in entomology is briefly reported by the divisions of field crop and garden insects, forest insects, foreign pests suppression, systematic entomology, Destructive Insect and Pest Act Advisory Board, fruit insect investigations, insecticide investigations, natural control investigations, mosquito investigations, household insects, insects affecting stored products, etc. A brief report of work at field laboratories is included.

Catalogue of Jamaica insects [trans. title], C. C. GOWDEY (*Jamaica Dept. Agr., Ent. Bul. 4 (1926), pts. 1, pp. [2]+114+XIV; 2, pp. 10+II*).—This catalogue is arranged by orders and families. A description of New Diptera from Jamaica by C. H. Curran is given in an appendix (pp. 102-115).

Studies of the polyhedral diseases of insects due to filterable viruses, R. W. GLASER (*Ann. Ent. Soc. Amer., 20 (1927), No. 3, pp. 319-343, figs. 22*).—The studies here reported relate primarily to grasserie of silkworms and wilt of tent caterpillars. It was found that the viruses of both these diseases are easily filtrable through Berkefeld "V" and "N" candles. They can be passed through the "W" candles only with difficulty, and can not be passed through the Pasteur-Chamberland "F" filters. These results may, however, depend upon the size or formation of the filter pores, upon the flexibility or rigidity of the virus particles, upon the electrical charge, or upon some other factor. Infection by the viruses occurs naturally through the mouth by feeding, but can also be experimentally reproduced by inoculation. The period from infection to death varies from 4 to 24 days, with an average of 10 days. This variation probably depends upon the natural resistance of the host, upon the concentration of the virus, and upon temperature. The account concludes with a list of 21 references to the literature.

An eye-full for insect pests, M. W. NIXON (*Cornell Countryman, 25 (1927), No. 1, pp. 6, 21, figs. 2*).—This is an account of experiments being made to determine the insect's reaction to lights of various colors and intensities. Illustrations are given of light traps experimented with in the orchard and in fruit storage, and of a screen attachment carrying a high tension current capable of killing the pests instantly.

Fumigating greenhouses with calcium cyanide, G. A. FILINGER (*Ohio Sta. Bimo. Bul., 12 (1927), No. 6, pp. 181-184, figs. 2*).—The author calls attention to the advantages obtained from the use of calcium cyanide in the fumigation of greenhouses and describes the preparation for the fumigation procedure and the precautions to be taken. It is pointed out that this material is easy to apply and much safer to use than the other compounds of cyanide; that the material is easily stored; that aeration of greenhouses is unnecessary after fumigation, thus avoiding chilling of plants; that lower concentration of gas over a longer period insures a more thorough kill and a greater margin of safety; that the residue is harmless; and that the cost is much less than that of using the old pot method.

Notes on the carbon disulfide industry in Brazil and the use of carbon disulfide in combating *Stephanoderes hampei* (Ferr.) [trans. title], J. B. DA ROCHA (*Sec. Agr., Com. e Obras Pub. [Sao Paulo], Commis. Estudo e Debell. Praga Caféeira Pub. 18 (1926), pp. 37, pls. 6, figs. 4; Eng. abs., pp. 35-37*).—An account of the manufacture of this insecticide in Brazil, where it has been carried on for 53 years, and its use in combating insects, particularly the leaf-cutting ant, *Atta sexdens* (L.), and the coffee berry beetle, *S. hampei*.

Lubricating oils as insecticides in dormant spraying, E. L. GREEN (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 931-935, figs. 3*).—This contribution from the Washington College Experiment Station reports upon a series of lubricating oils, selected to represent the range of available oils, which were

tested as sprays for San Jose scale and leaf rollers under set conditions in 1925 and 1926.

It was found that the property of killing insects resides in a considerable range of lubricating oils, but is greatest in the portion that distills over between 240° and 300° C. at 40 mm. pressure. The author finds that toxicity of the kind studied is not apparently related to the viscosity of the oils. The presence of significant quantities of vapor or vapor pressure is doubtful, in view of the low field temperatures and the high boiling ranges of effective oils. Oils for this purpose may be from asphalt or paraffin base crude without prejudice to the effects. Oils that have been subjected to processes for completely removing the color are likely to be more effective than before the decolorizing treatment.

Scutigerella immaculata Newport, a pest in greenhouses, G. W. HERRICK (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 738-740).—This symphyliid is said to have been a serious pest of snapdragons at Nyack, N. Y. It has been reported to be widely distributed over the United States and to be injurious to various vegetable crops. A solution of miscible carbon disulfide is said to show promise of destroying the pest in the soil of the greenhouse beds.

Rapid spraying versus dusting in thrips control, F. B. HERBERT (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 665-667).—Reporting upon work with the pear thrips in California, the author is led to conclude that spraying for this pest is as expeditious as dusting except for the time lost in filling, which, with a supply wagon, would amount to 2 to 3 minutes per acre. Twenty acres were sprayed in one day with a medium-sized spray outfit, with a possibility of 40 to 50 acres with a large machine. A large spray machine, capable of handling two large guns, would spray a larger acreage per day than the average-sized power-driven duster. Spraying is more effective on pear thrips than dusting, and less dependent upon good weather. The labor cost of spraying is somewhat higher than dusting, which, however, is more than offset by the much lower cost of spray materials.

Extensions of the known range of *Eutettix tenellus* Baker and curly-top of sugar beets, W. CARTER (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 714-717).—This is a contribution from the U. S. D. A. Bureau of Entomology cooperating with the Montana Experiment Station. It is pointed out that a severe outbreak of the beet leafhopper during 1926, which caused heavy losses to the sugar beet industry in the intermountain region, was accompanied by a wide dispersal of the pest. Observations made of the occurrence of the leafhopper and curly top disease during a survey undertaken in cooperation with the States of Idaho and Montana and Canada to determine the new range of the pest are reported.

The variability of *Aphis gossypii*, C. H. BATCHELDER (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 2, pp. 263-278, figs. 6).—This is a report of studies of the range of variation in specimens of the melon aphid made with special reference to such external structures as are of value as key characters.

Spray and fumigation combination for resistant red scale, H. J. QUAYLE (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 667-673).—This is a contribution from the California Citrus Experiment Station which reports results of spray alone, fumigation alone, and their combination against the red scale on citrus trees. The highest efficiency was secured when fumigation followed within a week or 10 days the application of oil spray. The oil was found to absorb little if any hydrocyanic acid gas, and an oil spray serves as a protective film to the citrus tree, rendering it less susceptible to hydrocyanic acid injury.

Moth borer damage to different varieties of sugar cane, T. E. HOLLOWAY and W. E. HALEY (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 703-705).—Examinations made in fields in Louisiana of varieties of cane from Java said to be resistant to the sugar cane moth borer indicate that such is not the case. It is pointed

out, however, that their habit of long stubbling may reduce borer damage by reducing the number of hibernating larvae in planted seed cane. The situation is complicated by other factors, such as the extensive planting of corn, a favorite food plant.

Chemical treatment of bands as a supplemental control measure for the codling moth, E. H. SIEGLER, L. BROWN, A. J. ACKERMAN, and E. J. NEWCOMER (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 699-701).—Preliminary tests indicate that bands used as cocooning traps for codling moth larvae may be treated with a chemical toxic to the larvae. The use of such a chemical may make the removal and destruction of larvae that cocoon beneath the bands unnecessary. Beta-naphthol and an oil emulsion are said to have given some promise of being suitable chemicals.

The status of the oriental peach moth in the South, O. I. SNAPP (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 691-695).—First found in the South in the fall of 1923, the oriental peach moth (*Laspeyresia molesta* Busck) has since appeared in several localities in each of the Southern States except South Carolina and Louisiana. It is thought to have been carried into the South in infested apples. Studies of its life history and habits at Fort Valley, Ga., showed the occurrence of six generations and a partial seventh in 1925 and five generations and a partial sixth in 1926. The use of bait pans for the control of a light infestation, such as occurs in Georgia, was unsatisfactory and impracticable. Thus far, the pest has not been of any economic importance in that State, and because of the absence of a host to mature the broods of larvae that hibernate, it probably will remain a pest of minor importance in the Georgia peach belt. The original light infestation in that State has shown a marked decrease during the past two years. At the present time the known infestation is confined to trees in several cities and towns, and to a part of only two commercial orchards in the peach belt.

Preliminary experiments in the application of paradichlorobenzene in liquid form against the peach tree borer, E. H. SIEGLER and L. BROWN (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 701, 702).—Paradichlorobenzene dissolved in high-test gasoline and applied in liquid form around the base of the peach tree has been tested against the peach borer by the authors, preliminary experiments indicating it to be effective as a control measure.

Acalla comariana Zell. and the injury to strawberries caused by the moth in the south of Sweden [trans. title], N. A. KEMNER (*Meddel. Centralanst. Försökssv. Jordbruksområdet [Sweden]*, No. 315 (1927), pp. 37, figs. 12; *Eng. abs.*, pp. 33-35).—An account of an insect, first recorded from Scania and Småland in 1918 and 1921 as living on *Comarum palustre*, which since 1923 has become a serious pest to strawberry cultivation.

The susceptibility to malaria parasites and the relation to the transmission of malaria of the species of *Anopheles* common in southern United States, M. A. BARBER, W. H. W. KOMP, and T. B. HAYNE (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 41, pp. 2487-2502).—The authors report that the three species of *Anopheles* common in southern United States, *A. quadrimaculatus*, *A. punctipennis*, and *A. crucians*, are all easily infected with malaria parasites in the laboratory. All have been found infected in nature, *A. quadrimaculatus* and *A. crucians* with sporozoites in the salivary glands. *A. punctipennis* has been proved capable of transmitting malaria to man under laboratory conditions. *A. quadrimaculatus* is the summer species of widest distribution, and the one most commonly found in dwellings, and has been found infected in nature in higher proportion than the other species. Epidemiological evidence goes to show that it is the most important carrier of malaria in southern United States. In any antimosquito malaria control work this species should

receive first attention, but the authors do not believe that the evidence thus far can exculpate either *A. punctipennis* or *A. crucians* as possible carriers of malaria.

A list of 44 references to the literature is included.

Studies of the malaria problem in Porto Rico.—XI, Relation of breeding observations to adult catches (*Porto Rico Health Rev.*, 2 (1927), No. 11, pp. 29-37).—In these studies observations were made of *Anopheles gabhamii* and *A. vestipennis*, factors which may possibly influence seasonal variations in *Anopheles* activity, and the effect of rainfall on potential breeding areas.

Difficulties in mosquito control, R. W. DOANE (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 682-684).—This paper discusses some of the problems that arise in mosquito-abatement districts in the San Francisco Bay region, where reclamation and industrial projects have complicated a situation that was at first a comparatively simple one.

Mosquito control by airplane, J. A. LE PRINCE ET AL. (*Pub. Health Rpts.* [U. S.], 42 (1927), No. 28, pp. 2337, 2338).—This account consists of a memorandum on the distribution of Paris green by airplane in the control of *Anopheles* production in an uncleared pond near Bamberg, S. C., on September 8, 1927. Five hundred pounds of Paris green, with an equal quantity of soapstone, was distributed by a plane over a heavily overgrown pond of 500 acres, in which dense vegetation, both bushes and trees, shaded almost all of the water surface, flotage was heavy, and the production of *A. quadrimaculatus* was large. The application was made at a height of about 50 ft. above the tops of the trees, the planes making two trips with a 500-lb. load per trip. In a study of the pond immediately before the flight, heavy mosquito breeding was found. In an examination 2 hours after the commencement of the flight no live larvae were found in the clear areas, but some first stage larvae were still alive where trees and bushes covered the water. In an examination made the following day, 3 living larvae, 84 dead larvae, and 6 living pupae were found during the course of 703 dips made in all types of foliage.

Moist sand method of applying Paris green for destruction of subsurface-feeding mosquito larvae, T. H. D. GRIFFITHS (*Pub. Health Rpts.* [U. S.], 42 (1927), No. 44, pp. 2701-2705).—In the search for a method of applying Paris green for the destruction of mosquito larvae which feed below the surface or at the bottom, a mixture of Paris green with wet sand was applied with the result that the larvae of *Anopheles taeniorhynchus* and *A. sollicitans* were killed within 24 hours. It was observed that the wet sand carried the Paris green to the bottom, the greenish colored sand showing quite distinctly on the sandy bottom of the pool, with a very definite amount of sand and Paris green remaining on the surface of the water. The experiments which followed are described at some length, in all of which it was found that sufficient Paris green remained on the water surface to kill the *Anopheles* larvae. Since the production of salt-marsh mosquitoes generally takes place in comparatively shallow water, for these species the method is particularly effective. It is stated that there is no doubt as to the destruction of *Aedes aegypti* and other species in shallow containers.

Crane fly grub and the oat crop, J. RENNIE (*Scot. Jour. Agr.*, 10 (1927), No. 2, pp. 184-195, pl. 1).—An account of the crane fly and its life history with relation to the oat crop in Scotland, where *Tipula paludosa*, *T. oleracea*, and *Pachyrhina historio* have most frequently been met with.

Dispersion of *Compsilura concinnata* Meig. beyond the limits of the gipsy moth and the brown-tail moth infestation, J. V. SCHAFFNER, JR. (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 725-732, fig. 1).—This is a brief account

of an attempt made to obtain data, and some of the results achieved, on the dispersion of the imported tachinid *O. concinnata* beyond the limits of infestation of the gypsy moth and brown-tail moth.

[Quarantine control work with Mexican fruit fly in Texas] (*Citrus Indus.*, 8 (1927), No. 8, pp. 14, 30).—Announcement is made of the Federal quarantine effective August 15, 1927, against this fruit fly (*Anastrepha ludens*) in the Lower Rio Grande Valley, with the notice of the quarantine and notes on control work contemplated.

Important fruit districts of Argentina apparently free from fruit fly (*Citrus Indus.*, 8 (1927), No. 8, p. 36).—This is a brief reference to the findings of the U. S. D. A. Federal Horticultural Board in fruit districts of central Argentina.

Observations on the life history, habits, and control of the narcissus bulb fly, *Merodon equestris* Fab., in Oregon, J. WILCOX and D. C. MORE (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 708-714, pl. 1).—This is a contribution from the Oregon Experiment Station.

This bulb fly from Europe has become established in commercial plantings of narcissus, 14 per cent of the bulbs in one planting having been destroyed by it. The authors' observations show the seasonal history of this pest to be as follows:

Winter is passed as full grown larvae in the bulbs. In March and the early part of April the larvae leave the bulbs, usually through the neck, and pupate in the soil about 0.5 in. deep. The flies emerge mainly in April, but can be found in the fields until in June. Egg laying takes place in the latter part of April and in May. The majority of the eggs hatch in from 8 to 10 days, and the young larvae enter the bulb usually through the basal plate. The larvae are full grown by September. All larvae in the bulbs can be killed by the hot water treatment as applied for the stem nematode, *Tylenchus dipsaci* Kuehn. This treatment is not a cure-all, however, as it is impossible to remove all the bulbs from the soil when digging. Tests with ovicides made in the spring of 1926 were promising; 100 per cent control was obtained with corrosive sublimate.

A bionomical study of the cluster fly *Pollenia rudis* (Fab.) (Diptera, Calliphoridae), R. M. DECOURSEY (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 3, pp. 368-384, pls. 2, fig. 1).—The studies have shown that the earthworm *Helodrilus chloroticus* (Sav.), formerly considered the principal host of the cluster fly larvae, is not the principal host at Urbana, Ill. The first instar larvae in the laboratory readily attacked the earthworm *H. roseus* (Sav.) as an intermittent parasite or predator, but refused to attack *H. chloroticus*.

The frit-fly in Posen in the years 1921-1926 [trans. title], J. W. RUSZKOWSKI (*Rocz. Nauk Rolnicz. i Leśnych*, 18 (1927), No. 1, pp. 38-49, fig. 1; *Eng. abs.*, p. 49).—A report of observations from 1921 to 1926 of the frit fly in Posen. From 9 to 25 per cent of the larvae were found parasitized, *Rhoptromeria eucera tristis* Hrt. being the most important parasite.

The hippoboscid fly, *Ornithomyia avicularia* Linnaeus, as a carrier of mallophaga, H. E. EWING (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 2, pp. 245-250, fig. 1).—The author reviews the literature and tabulates nine records of mallophagan infestation of *O. avicularia*. He reports upon two specimens of *O. avicularia* found to harbor biting lice.

Fluosilicates as insecticides for the Japanese beetle, W. E. FLEMING (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 685-691).—Data obtained in a study of the insecticidal value of fluosilicates for the control of the Japanese beetle con-

ducted during the past two seasons indicate that the fluosilicates of barium, potassium, and sodium are of the same order of toxicity as acid lead arsenate.

Dusting found less expensive than spraying (*Illinois Sta. Rpt. 1927*, pp. 234, 235).—Brief reference is made to experiments by W. S. Brock begun in 1924, when it was found that curculio was satisfactorily controlled by a 10-10-80 dust, consisting of 10 lbs. of hydrated lime, 10 lbs. of lead arsenate, and 80 lbs. of superfine sulfur. In 1926, when the same dust formula was used, the dusted tree showed 1.8 per cent curculio and the sprayed ones 0.6 per cent, whereas 82.5 per cent of the fruit on the check trees was infested with curculio. Seven dust and five liquid sprays were used, the former being applied according to the regular spray schedule common for the section, while the dust applications were made at approximately two-week intervals throughout the season.

Recent developments in strawberry root weevil control, W. DOWNES (*Jour. Econ. Ent.*, 20 (1927), No. 5, pp. 695-698).—The strawberry root weevil (*Brachyrhinus ovatus* L.) is said to be the most serious pest of the strawberry on the Pacific Coast. Control work is referred to, and it is pointed out that the most recent control method consists in the use of poison bait consisting of chopped evaporated apple waste. Sodium fluosilicate, magnesium arsenate, calcium arsenate, and sodium fluoride may be used, all having been found effective, although in experimental work at Victoria, B. C., sodium fluosilicate was found the most satisfactory. Apple waste containing approximately 20 per cent moisture was found more attractive than super dried bait, and sodium fluosilicate was found the most suitable poison to use with waste containing that degree of moisture. A strength of 5 per cent of the poison was found to give the best results. Two applications of the bait are recommended, the first in April and the second in June.

Notes on the biology and habits of the Peruvian cotton square weevil (*Anthonomus vestitus* Bohm.), W. E. HINDS (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 2, pp. 251-254).—This is a report of observations made in the central coastal cotton-growing valleys of Peru in February and March, 1926.

Coffee berry borer, *Stephanoderes hampei* (Ferr.), D. G. MUNRO (*Planters' Chron.*, 22 (1927), No. 39, pp. 563-570).—This account deals with the biology, the variation between numbers of males and females, the distribution of the borer, breeding habits, alternate food plants, and natural enemies.

Contribution to the knowledge of the coffee berry beetle (*Stephanoderes hampei* Ferr. 1867 [trans. title], M. L. DE OLIVEIRA FILHO (*Sec. Agr., Com. e Obras Pub. [Sao Paulo] Commis. Estudo e Debell. Praga Caféiera Pub.* 20 (1927), pp. 95, pls. 46; *Eng. abs.*, pp. 77-92).—A practical, illustrated account of this important pest of coffee in Sao Paulo, Brazil.

A cinematographic campaign against the coffee berry beetle in the State of Sao Paulo [trans. title], A. PAMPLONA (*Sec. Agr., Com. e Obras Pub. [Sao Paulo], Commis. Estudo e Debell. Praga Caféiera Pub.* 19 (1927), pp. 104, pls. 27; *Eng. abs.*, pp. 101-104).—An account of the campaign against this coffee pest under way in Brazil, descriptions being given of the film and its exhibition.

On the biology of some ichneumonids of the genus *Paniscus* Schrk., A. M. VANCE (*Ann. Ent. Soc. Amer.*, 20 (1927), No. 3, pp. 405-417, pl. 1, fig. 1).—This is a contribution from the U. S. D. A. Bureau of Entomology. The author found that *P. spinipes* Cush. and *P. geminatus* Say var. *sayi* Cush. may be successfully reared under laboratory conditions. When so reared, females of both species readily oviposit upon larvae of the corn ear worm, but exhibit a decided preference for either cutworm or army worm larvae. The life history and habits of these two species in confinement are very similar. Females of both species reproduced partheogenetically.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals, III-VI (*Missouri Sta. Research Buls.* 97 (1927), pp. 70, figs. 20; 98 (1927), pp. 34, figs. 27; 99 (1927), pp. 11, figs. 2; 101 (1927), pp. 26, figs. 16).—This study of growth and development (*E. S. R.*, 56, p. 161) is continued.

III. Growth rates, their evaluation, and significance, S. Brody.—The author has determined that the growth curve is divided into two principal segments, one segment an increasing slope, representing increasing time rate of growth, and the other segment a decreasing slope, representing decreasing time rate of growth. The junction of the two segments occurs at puberty in animals, when about one-third of the mature weight is reached. From this it appears that the beginning of sex life coincides with the beginning of the disintegrative processes of old age. The increasing segment of the curve is divided into several epochs, during which the percentage rate of growth is constant with respect to the growth already made. In the other segment the percentage rate of growth is constant with respect to the growth yet to be made to reach maturity. This holds true only for animals which do not fatten with increasing age. The growth curve for populations is similar to the growth curve of individuals, except that it may not have the epochs mentioned above and that the curve is more symmetrical around its center.

IV. Growth rates during the self-accelerating phase of growth, S. Brody.—This phase of growth is made up of four or five segments apparently representing distinct stages of growth. The percentage rate of growth during each stage is constant, passing from one stage to the succeeding stage at a lower but constant percentage rate. The passage from one stage to the other is abrupt, similar to metamorphosis in cold-blooded animals.

V. The effect of temperature on the percentage rate of growth of the chick embryo, E. W. Henderson and S. Brody.—The eggs from Single Comb White Leghorn hens one year old or older were incubated at temperatures of 90, 94, 95, 99, and 105° F. In each lot 148 eggs were set except that incubated at 105°, in which 140 eggs were used. Previous to setting the eggs had been stored for from 7 to 9 days at 40 to 70°. During the early stages of incubation 10 embryos were weighed at each period after removing the amniotic membrane and draining the fluid. Of the eggs set at 90° all the embryos were dead the tenth day. In the second lot 12 embryos were weighed on the tenth and twelfth days, the remaining ones being found dead on the fourteenth day. Ten eggs in lot 3 were infertile, 41 embryos died during incubation, and the remainder were weighed. In lot 4, 11 eggs were infertile, 24 embryos died, and 113 were weighed. In this lot hatching occurred on the twenty-second instead of the twenty-first day, as is usual. In lot 5, 19 eggs were infertile, 27 embryos died, and the remainder were weighed.

The results of these weighings showed that the chick embryo passes through several stages of growth, and that the percentage rate of growth at each stage is similar to that previously noted. Before the embryo was 13 days old an increase of 1.8° in temperature resulted in an average increase in the rate of growth of between 13 and 20 per cent. After the thirteenth day of incubation changes of temperature between the limits of 98.6 and 105.8° did not influence the rate of growth.

VI. Growth rates during the self-inhibiting phase of growth, S. Brody.—From an analysis of the self-inhibiting phase of growth the author points out that the principal property of this segment of the growth curve is that the time rate of growth declines by a constant percentage, which is characteristic for a given

organism or population. Environmental conditions exert some influence on this decline. Charts are presented including the growth curves of cattle, horses, swine, sheep, other animals, some plants, and several populations.

Feeding alfalfa hay, J. SOTOLA (*Washington Col. Sta. Bul.* 220 (1927), pp. 35, figs. 7).—The author summarizes the results of experiments on feeding alfalfa hay to cattle, both beef and dairy, sheep, hogs, horses, and poultry at a number of experiment stations. Information on the composition, curing, preparation, cutting, and comparative value of the different cuttings of alfalfa hay is also given.

Steer-grazing investigations (*U. S. Dept. Agr., Tech. Bul.* 17 (1927), pp. 33–36).—The average gain for 7 years at the Dry-Land Field Station, Ardmore, S. Dak., in a pasture carrying 1 steer to 15 acres has been 231.2 lbs., or 1.67 pounds per day. The gains over the same period in a pasture carrying 1 steer to 8 acres has been 167.2 lbs., or 1.2 lbs. per day. The first pasture has been undergrazed and not carrying the number of cattle it could support, while in the second pasture the feed has been exhausted in the drier years. In a rotated pasture carrying twice as many cattle as either of the others, the average gain has been 177.6 lbs. No change in the character of vegetation has been noticed with any of the methods and intensities of grazing.

Sweet clover experiments in pasturing, J. H. SHEPPERD (*North Dakota Sta. Bul.* 211 (1927), pp. 57, figs. 15).—This bulletin presents in a popular manner the results of two years' observations on grazing sweet clover, both white and yellow blossom, and brome grass with steers. The effects of the pasture on the cattle and the effects of the cattle upon the pasture are carefully noted. Appended are observations of 20 farm managers of the effect of sweet clover in various sections of the State.

Shock corn for yearling steers, H. W. ROGERS and G. BOHSTEDT (*Ohio Sta. Bimo. Bul.*, 12 (1927), No. 6, pp. 178–180, fig. 1).—Two lots of 15 yearling steers each were fed at the Madison County Experiment Farm to compare shelled corn and shock corn for cattle of this age. In addition to the corn both lots received cottonseed meal, clover hay, and corn silage for 119 days. There was little difference in the average gains of the two lots. Both lots brought the same price on the market, but due to a lower feed cost per 100 lbs. of gain the steers receiving shelled corn returned \$3.08 more per head over feed cost than those fed shock corn.

Shock corn for heifer calves, G. BOHSTEDT (*Ohio Sta. Bimo. Bul.*, 12 (1927), No. 6, pp. 171–178, figs. 2).—Nine lots of 10 heifer calves and 1 lot of 10 steer calves were fed to compare steers and helpers, shock corn and shelled corn, and finishing helpers on pasture v. dry lot. The first 6 lots were fed for 154 days and then marketed. The remaining lots were roughed through the winter and finished on pasture, except 1 lot which was finished during the summer in dry lot. The rations fed in the respective lots were lot 1 long shock corn, oil meal, alfalfa hay, and silage; lot 2 cut shock corn and the remainder as in lot 1; lot 3 same as 2 with no silage; lot 4 as in 2 with no hay; lot 5 as in 2 except shelled corn replaced shock corn; lot 6 same as 5 (steers); lot 7 oil meal, alfalfa hay, and silage; lot 8 as in 7 but no oil meal; lot 9 oil meal 2 lbs., alfalfa hay, and silage; and lot 10 oil meal 1 lb. with the remainder as in 9. On pasture, lots 7, 8, and 10 received ground corn and oil meal, while lot 9 received ground corn, oil meal, alfalfa hay, and silage in dry lot.

The average daily gains per head during the winter months in the respective lots were 1.77, 1.93, 1.86, 2.01, 2.33, 2.37, 1.61, 1.15, 1.65, and 1.44 lbs. During the summer feeding the average daily gains in lots 7 to 10 were 1.21, 1.44, 1.44, and 1.16 lbs., respectively. For the entire year these last lots made average daily gains of 1.47, 1.26, 1.57, and 1.33 lbs., respectively. None of the heifers

fed shock corn were finished as well as those fed shelled corn and sold at a lower price per hundredweight.

Under the conditions of this experiment the feeding of shock corn, either long or cut, was less economical than shelled corn. Cutting shock corn had the advantage of trampling the refuse more thoroughly into the manure, thus destroying the corn borer larvae. The ration fed in lots 5 and 6 has consistently been an economical one. Steer calves made somewhat larger and cheaper gains than heifers, and in this case sold for 25 cts. more per hundredweight. Feeding oil meal during the winter to calves to be finished on pasture was economical. Finishing heifers in dry lot during the summer was more economical than finishing on pasture.

Economic beef production investigation (*Arkansas Sta. Bul.* 221 (1927), p. 37).—Continuing this study (*E. S. R.*, 56, p. 365), the 7 purebred calves, 18 calves from grade cows and scrub cows sired by purebred bulls, and 6 calves from scrub cows by scrub bulls were fed in separate lots for 162 days on shelled corn, cottonseed meal, cane silage, and alfalfa hay. The average daily gains per head in the respective lots were 1.74, 1.63, 1.68, and 1.34 lbs. The feed required for 100 lbs. of gain was least in the purebred lot and highest in the scrub lot. The purebred calves sold for \$1.75 more per hundredweight than the scrubs. The high grades sold at the same price as the purebreds, and the first cross calves for 50 cts. less.

[**Experiments with beef cattle at the Illinois Station**] (*Illinois Sta. Rpt.* 1927, pp. 92–102, 103, 104, fig. 1).—The results of the following experiments are noted:

[**Fasting experiments with steers**].—H. H. Mitchell and T. S. Hamilton made observations on 4 steers during a 10-day fast. Before starting on the fast the steers had been on a fattening ration on which they were making daily gains ranging from 1.36 to 2.49 lbs. The total percentage of decrease in weight during the fast ranged from 5.6 to 8.6 per cent. The water intake during fast was irregular and below that of the feeding period. The urinary output was in keeping with the irregular intake of water. The excretion of feces decreased steadily, but even at the end of 10 days from 0.55 to 1.37 kg. were being voided. The pulse rate was lower during fast, the fasting level being reached on the third day. The steers spent more time in lying down during fast than when on feed.

Records of the carbon dioxide production were kept on 2 steers in the standing and lying positions. One steer had an hourly carbon dioxide production in the lying position of 81.07 gm., while in the standing position it was 98.24 gm. These records for the second steer were lying 81.75 and standing 98.16 gm. The 24-hour heat production of these 2 steers in the lying position per square meter of body surface was 1,287 and 1,398 calories, respectively.

Insensible perspiration.—Hamilton, Mitchell, and C. H. Kick found that the daily insensible perspiration computed to a constant body weight on a fattening ration amounted to 23.8 lbs. on the average, for a maintenance ration of alfalfa hay 21.5 lbs., for a maintenance ration of timothy hay 18.8 lbs., and for fasting 9.19 lbs. This loss of weight is checked by every meal of food or drink of water and is accelerated by every voiding of excreta. Warm weather and activity increased the loss by increasing the evaporation of water from the lungs and skin.

[**Wintering beef cows**].—H. P. Rusk, in studying the possibilities of maintaining a breeding herd of beef cattle on the by-products of a common corn belt rotation, fed 10 cows for 154 days. During this time they ate an average of 54.62 lbs. of stover silage, 5.02 lbs. of oat straw, and 1 lb. of nitrogenous concentrate per head daily. With straw at \$4 a ton, concentrate at 1.6 cts. per

pound, and stover silage at \$2.75 a ton, this ration cost 10.11 cts. per cow per day. The cost of the silage was determined from accurate figures on the cost of the crop, cutting, filling silo, and shrinkage.

[*Siloing soft corn*].—Rusk and R. R. Snapp showed that siloing the snapped ears of immature corn is an effective method of storing it, and that 100 lbs. of dry matter in the grain of ear-corn silage will put as much gain on a calf as 100 lbs. of dry matter in shelled corn. Two fields of immature corn were used in the study. The husked ears from one field had a moisture content of 49.82 per cent and from the other field 41.54 per cent. Of the material siloed 84.7 per cent was green ears and 15.3 per cent the attached husks. One ton of this silage was calculated to be equivalent to 16.04 lbs. of No. 1 shelled corn. A lot of 15 calves fed this silage, together with 2 lbs. of alfalfa hay and 1 lb. of cottonseed meal to each 7 lbs. of shelled corn eaten, was compared to a group of 10 calves fed shelled corn, ordinary corn silage, alfalfa hay, and cottonseed meal. The gain was slower in the lot fed ear-corn silage, but on a shelled corn basis the calves fed ear-corn silage ate 359 lbs. of grain for 100 lbs. of gain, while those getting shelled corn ate 360 lbs. not counting that in normal silage.

[*Soy beans and their products*].—In an experiment by Rusk and Snapp, 4 lots of calves were fed a basal ration of shelled corn, alfalfa hay, and corn silage. In addition lot 1 received whole soy beans, lot 2 ground soy beans, lot 3 soy bean oil meal, and lot 4 cottonseed meal. Cottonseed meal proved more palatable than the other supplements. The calves so fed ate more concentrates, gained faster, and reached a higher finish than the other lots. Soy bean oil meal proved to be the best of the soy bean supplements. Calves on this feed gained faster on less feed and reached a higher finish than either of the other lots fed soy beans.

[*Baby beef production*].—In a comparison of 10 steer and 10 heifer calves as baby beef producers, Rusk and Snapp found that aside from the fact that the heifers finished sooner than the steers, no marked difference was noted in a 140-day feeding period. The gains and amounts of feed required for 100 lbs. of gain were approximately the same in both lots. The values placed on the heifers at the feed lot were closer to the extreme top of the market than the values placed on the steers.

[*Quality of meats as studied at the Illinois Station*] (*Illinois Sta. Rpt. 1927, pp. 105-114, figs. 3*).—H. H. Mitchell, T. S. Hamilton, S. Bull, and J. H. Longwell are making a study of the factors affecting the quality of pork and the quality and composition of beef. The effect of condition, age, grade, sex, and cut on the quality and composition, especially of the lean, is the object of the study.

A chemical method for measuring toughness has been devised which entails an analysis for collagen and elastin. The first of these represents a temporary toughness, while the second is a permanent toughness. It has been found that pork cuts taken from different parts of the same carcass do not vary greatly in toughness, while some beef cuts from the same carcass contain three times as much fiber as others. Barrow cuts in this test were tougher in all cases than sow cuts. A study is being made of the color in meat, using the spectrophotometer, but so far no definite conclusions can be drawn.

Two heifer and 2 steer calves graded as feeders were slaughtered and compared. The heifers were somewhat fatter than the steers, although all carcasses lacked finish. In general the fat was yellow and the lean a light vealy color. The steers did not cut out more in the high-price cuts than did the heifers. All the wholesale cuts of 1 heifer and 1 steer were separated into lean, fat, bone, and tendon. The heifer carcass contained 21.46 per cent fat, while that of the steer had only 13.21 per cent. The visible fat, separable by knife,

contained 68.5 per cent fat in the case of the heifer and 46.3 per cent fat in the case of the steer. In the other carcasses the lean of the rib eye contained 4.31 per cent fat in the heifer and 1.62 per cent in the steer.

It was found that the tenderloin, round, sirloin, porterhouse, and rib are the tenderest cuts of beef. The chuck ribs and the navel are intermediate, while the fore shank is the toughest of all cuts examined. The rib eye of the ninth, tenth, and eleventh ribs of the heifer contained 11.7 per cent collagen and 0.6 per cent elastin, while similar cuts from the steer had 8.1 per cent collagen and 1.6 per cent elastin.

Steers and heifers from the same lot of calves were fed for 140 days and then slaughtered. Heifers showed a little more condition than the steers, but were not as smooth. There was no difference in dressing percentage due to sex. The steer carcasses had more natural fleshing judging from the eye of beef measured at the twelfth rib, the average of the steers being 76 sq. cm. and the average of the heifers 68.7 sq. cm.

[Experiments with sheep at the Illinois Station] (*Illinois Sta. Rpt. 1927*, pp. 121-127).—The results of experiments with sheep are reported.

[*Alfalfa hay for lambs*].—In continuing this work (E. S. R., 56, p. 367), W. G. Kammlade and J. H. Knox fed 2 lots of 25 lambs each in dry lot and 2 lots of 50 lambs each in the field. Lot 1 in dry lot was hand-fed shelled corn and alfalfa hay for 80 days. Lot 2 in dry lot was fed in the same manner for 21 days and then self-fed ground corn and cut alfalfa hay for 59 days. Lot 3 in the field was started on 5.3 acres of corn and soy beans and then placed on 1.62 acres of corn with 0.5 lb. of alfalfa hay for the last 52 days. Lot 4 was placed on 1.62 acres of corn and 15 acres of alfalfa pasture for 49 days and the same cornfield with 0.6 lb. of alfalfa hay daily for the last 31 days.

Lot 1 made an average daily gain of 0.32 lb. per lamb and attained a very satisfactory finish on a reasonable amount of feed. In lot 2 the lambs gained 20.6 per cent more than those in lot 1, but required 9.1 per cent more corn and 4.03 per cent more hay to make 100 lbs of gain during the period on corn and soy beans. The lambs in lot 3 gained but 2.9 lbs. per head during this period, and at the end of the test weighed 4.1 lbs. less than the lambs in lot 1. In lot 4 the lambs made a gain of 12.1 lb. during the first 28 days and practically the same gain for the entire test as lot 1. The calculated corn consumption per 100 lbs. of gain compared favorably with that in lot 1. While on alfalfa pasture a few mild cases of bloat developed, but no losses occurred even though the lambs were not removed in wet weather or after the alfalfa had been frosted.

[*Digestion trials with sheep*].—Continuing the work previously noted (E. S. R., 57, p. 68), 25 lambs of approximately 65 lbs. each were divided into 3 lots to study the extent to which sheep use the energy in a ration of equal parts of corn and alfalfa hay. Kammlade, H. H. Mitchell, T. S. Hamilton, and S. Bull analyzed individually the carcasses of the 8 lambs in the first lot at the start of the experiment to compute the composition of the gains of fattening sheep. A second lot of 8 lambs were fed a maintenance ration, and 9 lambs in the third lot were fattened to an average weight of 90 lbs. and then killed and analyzed.

Digestion trials were conducted with the maintenance and fattening lambs, during which time the maintenance sheep ate an average of 1.32 lbs. of dry matter daily and the fattening sheep an average of 1.96 lbs. From the data secured it was computed that for maintenance sheep an average of 59.8 per cent of the gross energy of the ration is metabolizable and for fattening sheep an average of 62.3 per cent.

The 8 check sheep averaged 58.5 lbs. at slaughter and had a "fill" of 16 per cent. The 9 fat sheep averaged 86.7 lbs. at slaughter and had a fill of 11.1

per cent. The fattening sheep made an average gain of about 20 lbs., which contained 74.6 per cent of dry matter, 11.5 per cent of crude protein, 53.8 per cent of fat, and 2.4 per cent of mineral matter. Each pound of gain was estimated to contain 2,620 calories.

The maintenance sheep averaged 69 lbs. at slaughter and seemed to need 1.46 lbs. of the ration per 100 lbs. of live weight, or 1,571 calories of metabolizable energy. By indirect calculation it was computed that 47 per cent of the metabolizable energy consumed in excess of that needed for maintenance was converted into the energy of the gain in weight during feeding.

[Experiments with swine at the Arkansas Station] (*Arkansas Sta. Bul.* 221 (1927), pp. 43-46).—Results of three experiments, all of which are continuations of those previously noted (*E. S. R.*, 56, p. 369), are reported.

Soft pork investigations with the by-products of rice.—Seven lots of pigs, averaging approximately 52 lbs. each, were fed for 8 weeks, lots 1 and 2 on rice bran, lots 3 and 4 on rice polish, lot 5 on a mixture of brewer's rice 60, rice bran 20, and rice polish 20, lot 6 yellow corn, and lot 7 rice bran. This last lot was approximately 30 lbs. heavier than lots 1 and 2. After this feeding period, the fat in the first 4 lots was found to be soft, and the pigs were changed to rations of either yellow corn or brewer's rice. Pigs fed rice bran made average daily gains of 0.52 lb. each for the 20 smaller hogs and 0.75 lb. for the 9 larger hogs. At the end of the first part of the feeding they lacked in thrift and general appearance. The 20 pigs on rice polish made an average daily gain of 0.96 lb. each and were in good condition. When changed to yellow corn and brewer's rice, the average daily gains were 1.68 and 1.22 lbs., respectively. After the finishing period on corn and brewer's rice the first 4 lots were killed and the carcasses graded as follows: 7 hard, 16 medium hard, 10 medium soft, and 4 soft. The pigs in lot 5 killed 5 medium soft and 4 soft; in lot 6, 6 killed hard, 1 medium hard, and 1 medium soft; and in lot 7, 3 killed hard, 4 medium hard, and 2 medium soft.

Of 15 pigs from sows fed rice bran and polish with some tankage to farrowing time, 9 killed hard, 5 medium hard, and 1 medium soft when finished on corn, shorts, and tankage.

Legume hay for brood sows.—Three gilts fed a ration of corn chops, two-thirds, and alfalfa meal, one-third, farrowed an average of 9.7 pigs per litter and weaned 26 pigs, which averaged 23.1 lbs. at this time. In contrast, gilts receiving corn chop and 20 per cent of alfalfa meal and 3.5 per cent of tankage or 7.5 per cent of alfalfa meal and 5.5 per cent of tankage farrowed litters of 7.5 and 8.3 pigs per litter, weaned 14 and 21 pigs which weighed on the average 33.4 and 30.6 lbs. each, respectively. In addition to the above feeds the sows had access to minerals. The alfalfa meal as a sole supplement to corn was satisfactory during the gestation period, but was too bulky for the sows during the suckling period.

Forage crops for growing and fattening swine.—Pasture trials with Sudan grass and sweet clover with and without mineral supplement and raw bone meal as compared with raw rock phosphate showed that pigs grazing sweet clover made uniformly larger and somewhat more economical gains than those on Sudan grass. On sweet clover pasture raw rock phosphate seemed more efficient than bone meal, but the lot receiving no minerals except salt excelled both. On Sudan grass the lot receiving salt made the poorest showing and those receiving raw rock phosphate the best.

[Experiments with swine at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 74-86).—The results of experiments with swine, some of which are continuations of work previously noted (*E. S. R.*, 56, p. 370), are reported.

[*Oats for sows*].—Continuing this work with sows and gilts to determine the value of oats in rations of ear corn, tankage, alfalfa hay, and minerals, W. E. Carroll and R. A. Smith found that oats can be successfully used to replace at least one-half the corn. Oats had no apparent effect upon the number of pigs per litter, the vigor of the pigs at birth, or the capacity of the sows as mothers. More feed was required when oats were fed to keep the gains up to the standard of the corn-fed lots.

[*Oats for fattening hogs*].—In attempts to use oats more extensively in the ration of fattening hogs, Carroll and Smith fed 9 lots of hogs on varying combinations of cracked and shelled corn and whole oats, finely ground oats, oat kernels, and hulled oats. All lots had free access to a supplementary mixture of 2 parts of tankage, 1 part of linseed meal, and 1 part of alfalfa meal, and water and salt were available. It was found that the gains in all lots were quite uniform. Oat kernels were more palatable than cracked or shelled corn, and hulled oats were nearly as palatable. Whole oats must be somewhat cheaper than corn, pound for pound, before they can be profitably fed in the ratio of 1:4 with corn to fattening hogs. Under ordinary conditions it will pay to grind oats rather than feed them whole. Whether hulling oats will be more profitable than grinding depends upon the proportion of oats fed and the cost of the two operations. When fed in the proportion of 1:4 with corn, oat kernels were worth from \$1.21 to \$2 per 100 lbs. more than finely ground oats.

In a palatability test in connection with the above, hogs having free access to finely ground oats ate nearly twice as much oats and less corn and protein supplement, and the rate of gain was lower than when coarsely ground oats were used.

[*Cottonseed meal for fattening hogs*].—Carroll and Smith undertook to see if cottonseed meal could replace the linseed meal in the dry lot supplement of 2 parts of tankage, 1 part of linseed meal, and 1 part of alfalfa meal. Two lots of 20 63-lb. pigs were fed for 112 days in dry lot on shelled corn with the two supplements, and each lot had access to a mineral mixture. The gains in both lots were practically identical. More of the cottonseed meal supplement was eaten, but less corn was consumed than when linseed meal was used. Somewhat less feed was required for 100 lbs. of gain when cottonseed meal was used. No harmful effects were noted from feeding cottonseed meal, but it was considered that pigs fed cottonseed meal lacked somewhat in luster of coat and finish at the end of the experiment as compared with the linseed meal group.

[*Hogging down v. dry lot feeding*].—Carroll, Smith, S. Bull, and J. H. Longwell found that little was gained by picking new corn and feeding it in dry lot with a protein supplement instead of letting the pigs harvest the corn themselves. The approximately 11 per cent more total feed required by the pigs in the cornfield to make 100 lbs. of gain was not enough to pay the cost of picking the corn. Pigs on standing corn and tankage made the same daily gain as pigs fed old shelled corn and a supplement in dry lot. The cornfield pigs required approximately 20 per cent more total feed for 100 lbs. of gain than the dry lot pigs. Six lots of 20 pigs each, weighing 130 lbs. each, were used.

[*The effect of soy beans on the carcasses of hogs*].—A study of the carcasses of hogs fed soy bean oil meal and soy bean oil was made by Bull, Longwell, Carroll, and Smith. Four lots of 15 pigs each were fed, the check lot receiving shelled corn, tankage, and alfalfa meal. The second lot received 14 per cent soy bean oil meal in place of the tankage. The third and fourth lots also received 14 per cent soy bean oil meal, and in addition 1.37 and 2.87 per cent soy bean oil, respectively. The carcasses in the check lot were all hard. Lot 2 produced 3 hard, 8 medium hard, and 4 medium soft carcasses; lot 3, 9 medium

soft and 6 soft carcasses; and lot 4, 1 medium soft and 14 soft carcasses. The grading of the cured hams and bacons was similar to the grading of the carcasses.

[*Getting hard pork from soy beans*.]—The problem of hardening the pork of soy bean fed hogs was undertaken by Bull, Longwell, Carroll, and Smith. Four lots of 10 pigs each and one lot of 20 were used in the study. The check lot received shelled corn and the regular Illinois protein supplement. All other lots received 80 per cent of ground corn and the following supplements: Lot 2 20 per cent of ground soy beans, lot 3 15 per cent of ground soy beans and 5 per cent of tankage, lot 4 20 per cent of ground soy beans to 150 lbs. in weight and then 90 per cent of corn and 10 per cent of tankage, and lot 5 20 per cent of ground soy beans to 175 lbs. in weight and then 90 per cent of corn and 10 per cent of tankage. All lots had access to a mineral mixture. Hogs were slaughtered at 225 lbs. in weight, and notes were taken of shrinkage and dressing percentages. Fat samples were taken from the backs of each hog in lot 4 at 150 lbs. and from lot 5 at 175 lbs. of live weight for determination of the refractive index. Twenty-eight hogs have been slaughtered, and the carcasses graded as follows: Lot 1 10 hard and 2 medium hard, lot 2 1 medium soft and 4 soft, lot 3 1 medium hard and 4 soft, lot 4 2 medium soft and 3 soft, and lot 5 1 soft.

[*Experiments in swine feeding at the Pennsylvania Station*], M. F. GRIMES (*Pennsylvania Sta. Bul.* 213 (1927), pp. 13, 14, fig. 1).—The results of experiments in continuation of work previously noted (*E. S. R.*, 56, p. 165) are briefly noted.

[*Protein supplements and minerals*.]—In comparing the value of several protein supplements, the results obtained have favored the lots receiving tankage and fish meal when supplementing corn for fattening hogs.

[*Pasture for growing pigs*.]—Three groups of 25 pigs each were grazed for 60 days on rape, alfalfa, and Sudan grass. The rate of gain, costs, and general results were favorable to the lots in the order named.

[*Fattening ration of by-products*.]—Shelled corn and tankage; shelled corn, molasses, and tankage; stale bread and tankage; and stale crackers and tankage were compared as rations for fattening hogs. The by-products were about equal in producing gains, but were more costly than the corn and tankage ration. Large amounts of molasses were not palatable to swine. Stale bread caused extreme constipation when not fed with some laxative feed.

[*Swine investigations*, E. Z. RUSSELL (*U. S. Dept. Agr., Tech. Bul.* 17 (1927), pp. 36–39).—Beginning in the spring of 1923, records have been kept of the cost of handling pigs under different systems of feeding and management to determine which plan is most suitable to conditions existing at the Dry-Land Field Station, Ardmore, S. Dak. The systems followed are (1) full feeding corn on pasture (when available) from weaning to market weight, (2) carrying pigs through the pasture season on a limited ration of corn and selling as feeder pigs at an approximate weight of 100 lbs., and (3) full feeding corn and tankage after pasture season to market weight. Tables give the detailed records of the feed consumption and gains for the years 1923, 1924, and 1925, and also the results of fattening the feeder pigs sold to the University of Nebraska.

[*Chemical composition of the horse*] (*Illinois Sta. Rpt.* 1927, pp. 119–121).—H. H. Mitchell and T. S. Hamilton have analyzed the entire carcasses of a 22-year-old stallion weighing 1,525 lbs., a 17½-year-old mare weighing 1,700 lbs., and a 5-year-old mare weighing 1,605 lbs. Skin areas were 7.54, 7.64, and 6.06 square meters, respectively. Tables give the chemical composition of the blood, flesh, bones, and of the entire empty carcass, the percentages of the flesh,

bone, blood, hide, and viscera that make up the empty weight carcass, and the weight in grams of several of the visceral organs of two of the animals.

[Experiments with poultry at the Arkansas Station] (*Arkansas Sta. Bul.* 221 (1927), pp. 39, 40, 41).—The results of two experiments are noted.

Influence of certain feeds on the fertility and hatchability of hen's eggs.—Five pens of 10 Single Comb White Leghorns each were fed to determine the effect of certain feeds on the fertility and hatchability of eggs produced. The basal ration fed to all lots was composed of 1 part by weight of wheat bran, gray shorts, yellow corn meal, oat flour, and 0.5 part of meat scrap. In addition lot 1 received creamery buttermilk in place of water for one-half of each day, lot 2 germinated oats, lot 3 10 per cent of alfalfa leaf meal, lot 4 2 per cent of cod-liver oil, and lot 5 the basal ration only. The scratch feed for all pens was 2 parts of cracked yellow corn and 1 part of wheat. Five closely related cockerals were mated with the hens, the male birds being rotated from pen to pen each day. From the respective lots, 242, 236, 265, 291, and 298 eggs were set. The fertility was 84.2, 91.5, 88.3, 90, and 87.2 per cent, respectively. The percentage of dead germs was 18.5, 16.5, 16.9, 17.5, and 20.1, respectively. The percentage of hatch was 44.6, 51.1, 57.2, 56.1, and 56.6, respectively.

Value of rice by-products for laying hens.—In comparing rice and rice by-products as feeds for 4 lots of 14 pullets each, in their second laying season (E. S. R., 55, p. 64), it was found that the standard ration of wheat bran, shorts, oat flour, yellow corn meal, and meat scrap, with a scratch mixture of cracked yellow corn and wheat, gave a higher egg production than any combination of rice. The cost of producing eggs was cheapest in the lot fed the standard ration. The pen receiving the greatest amount of rice and rice by-products produced the heaviest eggs, but it also produced the smallest number of eggs.

[Experiments with poultry at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 133–139, 141–145, figs. 2).—Results of experiments with poultry are noted.

Can hens be made to lay better through surgery?—To study the effect of mutilating, or scarifying, the dormant ovarian tissue of low-producing hens upon their subsequent production, L. E. Card and E. Roberts divided a group of birds with records of not more than 60 eggs per year into two groups. Half of these were operated upon while the ovaries were dormant, and the others used as controls. All were housed together and fed a common ration. Eleven of the birds operated on lived to complete the year, and their record for the period January 1 to October 27 ranged from 0 to 107 eggs. In the control group the production ranged from 1 to 98 eggs. The average was 38 and 59 eggs per hen in the respective lots.

[*The effect of feeding grain in boxes.*].—Using 3 flocks of Rhode Island Reds and 3 of White Leghorns in a 44-week period, Card tested the advisability of feeding hens grain in boxes. One flock of each breed was self-fed mash and grain in the litter morning and night. The second lot of each breed received mash and grain in boxes, the boxes being removed after feeding, and the third lot grain and mash ground together and self-fed. The average egg production for the Rhode Island Red flocks from November 26, 1925, to September 29, 1926, was 117, 129, and 105 eggs, respectively, and for the White Leghorns 126, 124, and 116 eggs, respectively.

[*Basal heat production of chicks.*].—Continuing this study (E. S. R., 57, p. 663) with chicks, H. H. Mitchell, W. T. Haines, and Card found a rapid rise in the basal heat production per square meter of body surface from hatching to about 20 days of age with White Plymouth Rock and Leghorn chicks. A high level was sustained up to 30 days. With the White Leghorns the adult level of basal heat of from 750 to 800 calories per square meter of body surface was reached at 100 days of age.

[*Simple v. complex rations*].—White Plymouth Rock pullets fed by Card 40 weeks on a simple mash mixture containing wheat bran, flour middlings, and tankage, with corn, wheat, and oats as a scratch feed, averaged 86.5 eggs, while a lot receiving the same scratch feed and a mash mixture of ground corn, ground oats, wheat bran, flour middlings, and tankage averaged 84.6 eggs.

[*Wheat for chickens*].—Mitchell and Haines continued this work with cereals (E. S. R., 56, p. 372), determining the value of wheat. It was found that 100 gm. of wheat containing 94 per cent of dry matter had a heating effect of 63 calories, or 1 lb. of dry wheat contained 1,968 calories of gross energy. During digestion and assimilation, 384 calories were lost in the droppings, and absorption of the metabolizable energy increased the heat output of the chicken by 304 calories, leaving 1,280 calories net energy value for 1 lb. of wheat. The hen utilizes 65 per cent of the gross energy value of wheat as compared with 70 per cent of the energy of corn.

[*Pullets v. cockerels*].—Mitchell and T. S. Hamilton weighed pullets and cockerels biweekly from hatching time to maturity. During this time the cockerels made more rapid growth than the pullets. Groups of birds were removed from the flock for measurement, slaughter, and physical and chemical examination according to weight (E. S. R., 55, p. 669). Samples of 10 cockerels and 10 pullets were taken at weights of approximately 0.5, 1, 1.5, 2, 3, and 4 lbs. and of cockerels also at 5 lbs. It was evident that body weight increased much faster than body surface or any of the linear measurements. All of the linear measurements of the cockerels, with the exception of the depth at rear of keel and the length of middle toe, increased at approximately equal rates. With the pullets the changes in linear measurements were not so regular, the leg length in particular being relatively shorter in the older than in the younger birds. At the 4 lb. weight, the edible flesh and viscera of the pullets contained 57.5 per cent of the total dry matter, 50.5 per cent of the protein, 70.4 per cent of the fat, 63.5 per cent of the energy, 13.6 per cent of the ash, and 1.1 per cent of the calcium. These percentages for the 5-lb. cockerels were 44.3 per cent dry matter, 48.5 protein, 51.4 fat, 49.7 energy, 14.5 ash, and 1 per cent calcium.

[*Poultry experiments at the Pennsylvania Station*] (*Pennsylvania Sta. Bul.* 213 (1927), pp. 28–31, figs. 3).—Results of several experiments are noted.

The relative effects of ultra-violet light and cod-liver oil upon the eggs from fowls used for breeding purposes.—In tests of the hatchability and fertility of eggs, T. B. Charles and B. W. Heywang fed four groups of laying hens from November 11 to March 13. One group was used as a check; a second received cod-liver oil in addition to the basal ration. The third and fourth groups were exposed daily at a distance of 4 ft. for 30 minutes to the rays of a mercury vapor lamp and a carbon arc lamp, respectively. The average percentage of fertility in the respective groups was 93.3, 87.4, 87.6, and 89.3. The percentage of hatch of the total eggs incubated was 50.27, 58.41, 54.19, and 57.31 in the respective groups.

Seasonal broiler production.—In continuing this study (E. S. R., 56, p. 168) Charles and P. H. Margolf found that the previous recommendations also applied to the production of broilers for the Thanksgiving and Christmas seasons.

The inheritance of hatchability of eggs and livability of chicks.—E. W. Callenbach set eggs from Single Comb White Leghorns and Barred Plymouth Rocks at intervals of seven days starting February 8 and placing the last setting in the incubator May 3. Of 9,818 White Leghorn eggs set, 48.2 per cent hatched strong, vigorous chicks. From the 4,185 Barred Plymouth Rock eggs, 34.8 per cent of the chicks were strong and vigorous. The percentage of hatchability for the season for individuals varied from 0 to more than 90. The brooder mortality to May 21 was 8.3 per cent.

For winter eggs make the hens eat more, D. C. KENNARD (*Ohio Sta. Bmo. Bul.*, 12 (1927), No. 6, pp. 185-187).—The author suggests methods for inducing hens to consume more feed so as to keep up production during the winter months.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Arkansas Station] (*Arkansas Sta. Bul.* 221 (1927), pp. 37-39).—The results of two experiments are noted.

Rice polish v. yellow corn chops for dairy cows.—Two lots of three Holstein cows each were fed for 112 days by the single reversal system on a ration of 2 parts by weight of either finely ground yellow corn chops or rice polish, 2 parts of bran, 1 part of cottonseed meal, 1 part of linseed oil meal, and 1 part of gluten feed. No differences were apparent in the palatability of the two feeds, and rice polish did not cause scouring as it does in hogs. When on rice polish the cows produced 5 per cent more milk and almost 8 per cent more butter fat than when on corn chops, but the latter feed gave somewhat larger body gains. On rice polish 1.76 lbs. less grain, 3.8 lbs. less silage, and 2.38 lbs. less hay were required to produce 100 lbs. of milk, and for producing 1 lb. of fat 0.78 lb. less grain, 1.68 lbs. less silage, and 1.1 lbs. less hay was required.

When churned at 62° F. it required 1 hour for churning cream produced on rice polish as compared to 25 minutes for cream produced on corn chops. Butter from the rice polish cream was soft and greasy and the flavor was cheesy, but there was no difference in the color of the two butters.

Alfalfa hay v. mung bean hay for dairy heifers.—Two lots of 2 Holstein and 2 Jersey heifer calves each, averaging 149 days of age, were fed for 67 days to compare alfalfa hay and mung bean hay. Each lot received the same grain mixture and all calves were fed 6 lbs. of skim milk daily. At 14-day intervals the calves were weighed and measured at various parts of the body. The 2 lots made practically the same daily gain and the consumption of grain and skim milk was the same. More mung bean hay was eaten, although the amounts offered were the same. The calves fed mung bean hay required 4.61 lbs. less grain and 12.4 lbs. less skim milk, but 3.7 lbs. more hay for each 100 lbs. of gain. The increase in body measurements was quite uniform in both lots.

[Experiments with dairy cattle at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 150, 151, 154-156, 158, figs. 3).—Results of experiments are reported.

[Early maturing v. late maturing corn for silage].—In four successive seasons, W. B. Nevens found that three late-maturing varieties of corn weighed out 20 per cent more silage than did four earlier varieties. However, the acre yield of dry matter was 7 per cent less with the late maturing varieties. One hundred lbs. of silage from Reid Yellow Dent yielded more metabolizable energy than the silage from other varieties, and the amount of metabolizable energy available was closely related to the amount of dry matter.

[Measuring the color of milk].—The spectrophotometer is being used in a study of the relationship between the color in skin secretions and milk by W. W. Yapp and A. F. Kuhlman. The preliminary work indicates that the natural yellow color of milk is due to the butterfat. Normal milk from one cow produces a typical and uniform curve and the addition of a high concentration of fat from the same sample does not proportionately increase the reading of yellow. The period of lactation does not appear to have any very appreciable effect upon the color of the milk.

[Measuring the rate at which cows milk].—Preliminary work by W. L. Gaines in a study of the physiology of milking showed that one cow milked much

faster than another, although milked by the same machine and under the same conditions.

[Experiments with dairy cattle at the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 213 (1927), pp. 16-20, figs. 3).—The results of experiments are briefly noted, continuing previous work (E. S. R., 56, p. 168).

The vitamin B requirement of the calf.—The failure of helpers to lactate on a ration deficient in vitamin B was found by S. I. Bechdel to be due to an insufficient amount of alkali-carrying roughages in the ration. One helper was able to lactate on the above ration when it was supplemented with about 3 lbs. of over-ripe timothy hay.

Synthesis of vitamin B by bacteria in the rumen of cattle.—In this study Bechdel, H. E. Honeywell, R. A. Dutcher, and M. H. Knutsen made a permanent fistula on the left side of a cow. Portions of about 30 lbs. of fermented feed were removed from the rumen, incubated from 2 to 5 days, extracted with alcohol, and the extract fed to rats on a vitamin B-free ration. The study of the rats has given positive evidence of vitamin B in the extract. An organism that made up about 90 per cent of the bacterial flora present in the fermented feed was grown on vitamin B-free nutrient agar. This growth was dried and fed to young rats on vitamin B-free rations with results that showed the bacterial cells to be highly potent in vitamin B. These results indicated that cattle can synthesize their own vitamin B requirement through bacterial action in the rumen.

A study of the digestibility of the total ration as affected by grinding roughage.—This study by Bechdel, P. S. Williams, and C. D. Jeffries with 2 cows showed that when hay was ground and mixed with the grain the digestibility of the total ration was increased in all constituents except crude fiber, which was made less digestible by grinding.

Experiments with skim milk powder in the rations of dairy calves.—Bechdel fed a group of 12 calves from 34 days to 115 days of age on dry milk powder. Up to 6 months of age the calves made an average daily gain of 1.36 lbs. each and were 95.7 per cent normal in size. They consumed an average of 105 lbs. of milk powder each in addition to 120 lbs. of whole milk. The advantages of feeding dry milk powder are the reduction in labor required and also the reducing of sanitary precautions to a minimum. It is recommended that the calves be fed the dry milk after 6 weeks of age, and that the ration should then contain not over 45 per cent milk powder, and that this should be reduced as the calves grow older.

Dairy investigations, J. B. SHEPHERD, D. STUART, and R. R. GRAVES (U. S. Dept. Agr., Tech. Bul. 17 (1927), pp. 40-67, figs. 16).—The dairy work at the Dry-Land Field Station, Ardmore, S. Dak., has been in progress since 1917.

In studies of feeding and management practices, records have been kept of the milk and butterfat production, the quantity and cost of feed consumed by each animal, the acreage required to feed a cow one year on home-grown feeds, and the growth of dairy helpers and cost of raising them from birth to two years old. The results to date are given in tabular form.

The value of various pasture crops has been under investigation since 1922. Native pasture was found to have the lowest value per acre and also to require the largest acreage per cow for 112 days of pasture season. It has the advantage of having a stand that can be maintained indefinitely. Crested wheat-grass and brome grass, when satisfactory stands can be obtained, seem to offer more profitable pasturage than native grass. Sweet clover has had to be re-seeded once, and the stand in 1925 was unsatisfactory, making the value of this crop uncertain.

The breeding work has consisted of proving all the purebred bull calves born in the herd and of demonstrating the value of purebred Holstein bulls in grading up a herd.

[Experiments in dairying at the Illinois Station] (*Illinois Sta. Rpt. 1927*, pp. 158, 159, 160, 161, 162).—The results of the following experiments are briefly noted.

[*Methods of grading milk*].—A study of the accuracy and adaptability for grading and testing milk and dairy products was made by M. J. Prucha and A. S. Ambrose. The plate method, methylene-blue reduction, sediment, and acidity tests were used. The data show a correlation between bacterial plate counts and the results of the methylene-blue reduction test. The latter test seems to be a satisfactory test for grading raw milk.

[*Efficiency of pasteurizing milk*].—J. M. Brannon and Prucha began work with 100 different germs to determine their resistance to standard pasteurization temperatures. Sterile milk was inoculated with pure cultures, and the milk heated to temperatures ranging from 132 to 144° F. Thirty of the organisms studied were greatly reduced in numbers at temperatures as low as 132°. With four or five exceptions all the nonspore-forming organisms were destroyed at 142°, but no spore-forming organism has been completely destroyed at 144°.

Pasteurizing milk at 138° or higher for 30 minutes was found to destroy all avian tuberculosis bacteria and also the abortion bacteria in tests by Prucha and R. Graham.

[*Starters for butter*].—Studies by Prucha, H. A. Ruehe, and R. H. Tracy with a number of cultures of lactic acid bacteria showed a variation as to the development of flavors in butter. In some cases the best aroma was developed when cultures were incubated at 65 to 70°. The amount of inoculum within 0.1 to 5 per cent made no appreciable difference. Starters with an acidity of 0.7 to 0.9 per cent acid gave the best aroma. Holding butter for a short time at 60 to 70° tended to develop desirable flavors, especially in the case of ripened neutralized sour cream butter. The body of butter tends to be weakened at the ripening temperature.

[*Ice cream gelatins*].—The H-ion concentration of 48 gelatin samples was found to vary from 4.05 to 7.35 in studies by Tracy, Ruehe, and Brannon. In most cases the gelatins with a low H-ion concentration also had a low bacterial count.

[Experiments with dairy products at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 213 (1927)*, pp. 21–23).—Results of several experiments are noted.

Greenish discoloration in chocolate ice cream.—Greenish discoloration of chocolate ice cream in rust-free cans was found by C. D. Dahle to be due to the action of the alkali present, the metal of the can, and the tannin products in the cocoa. The source of alkali was either in Dutch process cocoa or the remains from the washing process. The difficulty can be overcome by rinsing the cans free from alkali or by using paper liners.

Cocoa v. chocolate liquor as a flavor in ice cream.—Dahle found that it required 2.4 lbs. of chocolate liquor to give the same degree of flavor to a 10-gal. batch of ice cream as was derived from 1.5 lbs. of cocoa. No difference in the flavor of the two was obtained if they were both from the same source.

Frozen cream as a source of fat in ice cream.—Fresh sweet cream frozen and stored at 5° F. for 4 months was found by Dahle as good a source of fat for ice cream as unsalted butter made from the same cream and stored under the same conditions.

Pasteurization of the ice cream mix by electricity.—Dahle and M. H. Knutsen found the Electropure process of pasteurization to be more effective in destroying bacteria in an ice cream mix than the holding method.

The acidity of ice cream mixes.—In studies of the effect of the serum solid content of ice cream mixes, Dahle and W. K. Budge found that mixes containing 8, 10, and 12 per cent serum solids tested on the average 0.17, 0.2, and 0.23 per cent acid, respectively, during the warm months and approximately 0.03 per cent less during the cold months. Partial pasteurization prior to homogenizing of high acid mixes lessened the freezing time and improved the quality of the finished product.

Studies on "cream line" formation.—Continuing this work (E. S. R., 56, p. 171), F. J. Doan obtained results that indicated that cream had the same freezing point as the milk from which it was separated, regardless of the richness. The adulteration of cream with water may be detected with the cryoscope, but the amount present can not be estimated accurately as in diluted milk.

The volume of cream obtained by pasteurizing by the continuous flow electrical process was 14.5 per cent, with cream pasteurized in a vat with water as the heating media 13 per cent, and with raw milk 15.3 per cent.

Examining a small portion of milk in a hanging drop of water with a high power objective has been found to be an accurate method of determining whether the cream of the milk has been viscolized. In such a sample the fat particles are clumped in very small globules.

[Studies of the viscolizing or homogenizing process].—In this work Doan and W. D. Swope determined that homogenization of milk or cream had little effect on the Babcock test. Clumping of the small fat globules of viscolized or homogenized milk does not become apparent until from 4 to 6 per cent fat is present, but becomes more pronounced as the fat increases beyond this point. Viscolized samples do not cream, but when diluted with unprocessed samples creaming takes place and the volume is larger than normal for the fat content. The clumping tendency is affected to a marked degree by the pressure used in the process.

Methods of processing chocolate milk and their effect on cocoa separation, cream separation, and general quality.—Continuous homogenization of chocolate milk for periods of 5, 10, and 20 minutes was found by Doan to cause an increase in the amount of cocoa sediment. Using gelatin, agar, gums, etc., to increase viscosity prevented cocoa sediment when used in proper amounts, but decreased the quality of the product. Malt extract powder was found to have a place as a flavor modifier. Chocolate liquor gave the same results as previously reported for cocoa (E. S. R., 56, p. 171).

The operation of the bacteriological laboratory for dairy plants, C. S. MUDGE (*California Sta. Circ. 310 (1927), pp. 28, figs. 10*).—This circular describes laboratory methods used to determine the number of bacteria present in milk. The author also points out the merits of these methods. A plan for a laboratory and the necessary equipment is included. Appended is a selected list of literature dealing with the methods described to be used for further reading.

[Experiments with neutralizers and starters at the Arkansas Station] (*Arkansas Sta. Bul. 221 (1927), pp. 41-43*).—Continuing this study (E. S. R., 56, p. 376), it was found that the soda neutralizers composed of sodium carbonate or sodium bicarbonate or combinations of the two required only 4.8 minutes to react with the acid in the cream. The calcium limes required 4 minutes or less to react with the acid, while the magnesium limes required 20 minutes. The average reduction in acidity caused by all neutralizers after pasteurizing was 0.0408 per cent. The soda compounds tended to thin the body of the cream and caused foaming, while the limes had a tendency to thicken the cream.

Using the same starters in commercial creameries gave results quite similar to those previously noted. The average score of all starter butter was 0.5 point greater than the score of nonstarter butters.

Standardization and improvement of California butter, F. H. ABBOTT (*California Sta. Bul.* 443 (1927), pp. 27, figs. 5).—A discussion of the need for the standardization and improvement of butter, the laboratory assistance given to cooperators in this work, and the methods suggested for creameries to follow in the handling of cream and butter to improve the quality of their product.

Field studies of the sources of mold in butter, H. MACY and W. B. COMBS (*Minnesota Sta. Bul.* 235 (1927), pp. 31, figs. 11).—The results of a creamery survey have demonstrated that proper pasteurization and sanitation can eliminate practically all the sources of mold in butter. All the raw cream tested in this work was heavily contaminated with mold. Other sources and the percentage of each were supposedly pasteurized cream 40 per cent, dry parchment and cloth circles 90, pipes and pumps 75, churns 65, water 44, starter 40, and salt 33 per cent. The sources of contamination are discussed, and methods of eliminating or reducing to a minimum mold contamination are pointed out.

VETERINARY MEDICINE

[Work in animal pathology at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 114–118, 127, fig. 1).—In investigations conducted by R. Graham, E. C. McCulloch, and H. S. Grindley, feeding tests conducted with samples of moldy sweet clover hay from a farm on which cattle losses had occurred resulted in the appearance of the symptoms in cattle and rabbits generally within from two to four weeks, weakness and sometimes swelling under the skin being observed. In autopsies, the swellings were found to consist of unclotted blood. Hemorrhages were also found in different tissues, sometimes occurring in the abdominal and chest cavities, and in other animals in the muscles or subcutaneous tissues beneath the skin of the back, chest, or rump. In feeding tests with rabbits it was found that when the moldy sweet clover was given with good alfalfa and good oats the rabbits remained apparently healthy for many weeks, suggesting the possibility of utilizing moldy sweet clover in this way. It was observed that either cold water does not extract the poison or else good alfalfa and good oats may counteract whatever poison is extracted by it.

In further studies by Graham and E. A. Tunnicliff (*E. S. R.*, 56, p. 379) of the indirect dangers of avian tuberculosis to calves, contact with infected premises proved less dangerous to the calves than did contact with infected birds. The rate of transmissibility was comparatively low even when the calves were directly exposed to tuberculous chickens. The indications are that the danger of avian tuberculosis spreading from calf to calf is slight as these animals are but slightly susceptible to the disease through ordinary exposure on the farm. Tuberculous lymph glands of cattle infected with the progressive bovine type of the disease fed and injected into healthy chickens resulted in only the occasional finding of gross lesions in the fowls. Several chickens treated in this way died of toxemia without showing gross lesions of the disease. Tuberculin prepared at the station and distributed to accredited veterinarians for tuberculin testing is said to confirm earlier findings of the value of such tuberculin as a diagnostic agent. It is pointed out that the value of this tuberculin in the diagnosis of the disease in fowls is greatest in infected flocks that do not show clinical symptoms, making it possible to eliminate such birds in the early stage of the disease.

Work in combating contagious bovine abortion by means of sanitation and the agglutination test was carried on by Graham, Tunnicliff, and McCulloch. Of

20 privately owned herds worked with, 5 are now free from the disease. The greatest progress in suppressing the disease has been made in herds where less than 5 per cent of the herd was infected on the initial test, herds showing 20 to 30 per cent infection not yielding so readily to the isolation method. Greater progress in controlling the disease in the station and privately owned herds has been obtained through sanitation and the elimination of reactors than by any other procedure. It is pointed out that abortion bacterins and living culture vaccine are limited in their application to badly infected herds of cattle and swine. In one herd where abortion has caused heavy losses over a period of several years, *Streptococcus alpha* has been repeatedly isolated from aborted feti and afterbirths. It is thought that a streptococci type of abortion may occur independent of the Bang bacillus infection and possibly be transmitted to the cow by the sire, since the reproductive organs of a slaughtered male were found infected with this organism.

In work with sheep parasites carbon tetrachloride was used in a number of farm flocks with considerable success.

The toxic constituent of richweed or white snakeroot (*Eupatorium urticaefolium*), J. F. COUCH (*Jour. Agr. Research* [U. S.], 35 (1927), No. 6, pp. 547-576, fig. 1).—In this report of investigations the author first presents a brief historical review of the disease, the discovery of richweed to be the cause, and previous chemical investigations of this plant. The details of the author's investigation include a tabulated summary of feeding experiments with *Eupatorium* extracts.

The results of chemical and pharmacological studies indicate that the constituent of *E. urticaefolium* responsible for trembles is tremetol, $C_{15}H_{22}O_4$, which has the properties of an unsaturated alcohol and is soluble in fats and fat solvents. This toxic principle may be secreted in milk and found in butter made therefrom. When tremetol is dissolved in petroleum ether and the solution is floated on the surface of sulfuric acid a characteristic red color is produced.

A volatile oil and a resin acid are also present in this plant, but neither of these is capable of producing trembles in sheep. The resin acid is toxic to rabbits and guinea pigs. Small doses of the volatile oil appear harmless, but larger doses are dangerous. Other constituents of the plant include fatty acids, especially acetic acid; a crystalline sterol, $C_{27}H_{46}O$, melting at 148 to 149° C.; inulin; levulose; an organic base; and a nontoxic glucoside. When richweed is dried the tremetol content rapidly diminishes, and when completely dry the plant is incapable of producing trembles, although the dried plant still contains the toxic resin acid and the volatile oil.

Sheep poisoned by richweed or by tremetol develop an acidosis and excrete acetone through lungs and kidneys. The sugar content of the blood is markedly increased. Guinea pigs that were poisoned by the dry plant, with the resin acid, or tremetol were not observed to excrete acetone.

[Tenacity of the eggs of intestinal parasites] (*Illinois Sta. Rpt. 1927. pp. 90-92, fig. 1*).—In studies conducted by E. A. Tunnickliff and W. E. Carroll a litter of pigs reared in a lot rested but unplowed and uncropped for a period of two years was compared with a second litter reared in a plowed and cropped lot. Fewer roundworms were found in the pigs reared in the plowed and cropped lot.

Studies of the viability of eggs of the swine ascarid and a number of other parasitic worms kept under various conditions were conducted by E. C. McCulloch, R. Graham, and Carroll. Eggs were obtained from the uteri of *Ascaris lumbricoides* and by macerating the bodies of the smaller species. The eggs were then placed on soil in covered porous dishes between layers of filter paper and covered with dirt. Two dishes containing the eggs of a parasite were

buried just beneath the surface of the ground in an open field and two were kept in the laboratory. Examinations were made at intervals to determine the viability of the worm eggs in the containers by mixing the material with water, allowing the eggs to settle to the bottom of the container, then decanting off the lighter debris and mixing the sediment with glycerine and a saturated salt solution. With the exception of the coccidia there was no difficulty at any time during a period of 12 months in obtaining eggs from any of the dishes left in the laboratory, which included the swine ascarid (*A. lumbricoides*), the large roundworm of chickens (*Heterakis perspicillum*), the cecal worm of chickens (*H. vesicularis*), the whipworm of swine (*Trichuris crenatus*), and the lungworm of swine (*Metastrongylus apri*). Of those buried in the field, no roundworm eggs were found after 8 months, no eggs of the whipworm of swine after 4 months, and no eggs of the lungworm of swine after 5 months. Eggs of the cecal worm of poultry buried August 10, 1926, were in normal condition when dug up and examined 8 months later.

Anti-abortion vaccines (*Arkansas Sta. Bul.* 221 (1927), pp. 7-9).—In anti-abortion vaccine work conducted over a period of three years marked individual variations in antibody production were found in the treated animals. The data indicate that in many animals *Brucella abortus* vaccine or bacterin treatment will induce no immunity whatever. The loss of antigenic qualities of *B. abortus* upon cultivation on laboratory media was found to be marked, and is thought to account for the variability of results secured by some investigators using large animals. Treatment with live cultures did not uniformly induce a higher agglutination titer than treatment with bacterin. No uniform superiority in inducing high agglutination titer appeared in the different types of bacterin. The results failed to show that the immunity following the administration of live cultures or of bacterins gives significant differences of persistence of immunity.

Reference is made to studies of the bactericidal properties of a number of selected sera from vaccine and bacterin treated rabbits and from untreated controls. Blood from normal animals and from those immunized against *B. abortus*, either with bacterin or vaccine and ranging in agglutination titer from 0 to 3,200 was withdrawn from the ear vein under strict aseptic conditions. The blood was immediately centrifuged and the serum used without inactivation. Into each of a series of sterile, corked serology tubes a measured quantity of a 48-hour growth of *B. abortus* was placed, and to this was added dilutions of each serum from 1/10 to 1/160 in one trial and in another trial dilutions from 1/20 to 1/1280. The mixture of serum and organisms and control tubes containing suspension of organisms only were incubated for 2 hours at 37° C., after which all tubes were cultured by streaking a 1 mm. loopful of material of the contents on the surface of agar slants having a surface area of approximately 6 sq. cm. The tubes were incubated at 37° in a jar containing 10 per cent of carbon dioxide. At 24 and 48 hours the slants were examined, an abundant growth being present in 48 hours, and no appreciable difference could be detected between the control tubes and those inoculated from the different dilutions of sera, or between sera of high and of low agglutination titer. A serum which gave an agglutination titer of 1/3200 showed no more bactericidal influence than did the serum of treated animals in which the agglutination titer was less than 1/20. Normal serum was also found to be without bactericidal effect.

Anthrax prophylaxis (*Arkansas Sta. Bul.* 221 (1927), pp. 29, 30).—Studies were conducted with a view to the preparation of a germ-free product which would be of value in the active immunization of animals against anthrax. Virulent *Bacillus anthracis* was cultivated in milk serum, egg white solution,

blood serum, Dunham's peptone broth, and Dunham's peptone broth plus sterile fresh liver and spleen. The Dunham's peptone broth was sterilized under steam pressure, and the spleen and liver masses were taken aseptically from a freshly killed guinea pig and immediately added to one quantity of this fluid. Both bovine and equine blood serum were used, in some cases undiluted and in other cases diluted 2, 4, and 10 times with peptone broth. The anthrax bacillus was cultivated in these various media in some trials for 48 hours, in other trials for 1 week. After this period of incubation, the various cultures were sterilized by filtration, and the filtrates were used in tests on rabbits and guinea pigs.

The test on guinea pigs revealed an absence of any demonstrable aggressin effect on the part of any of the filtrates. Moreover, no evidence of a toxic action was noted following the injection of the various filtrates into these animals, but when rabbits were injected intraperitoneally with blood serum culture filtrates and 10 to 14 days later with virulent *B. anthracis* a distinct fortification of resistance appeared to have occurred. In one trial 3 out of 6 animals treated in this manner survived and a fourth lived considerably longer than any of the 6 untreated controls, all of which died as the result of the test inoculation. In another trial the results were identical, and in a third experiment 5 out of 6 treated animals survived, whereas all 4 controls died of anthrax. The other types of culture filtrates employed did not give evidence upon administration to rabbits of possessing any immunizing properties. Similarly, a *B. anthracis* bacterin in which a 24-hour culture of the organisms was used, the suspension being rendered sterile by phenolizing to a concentration of 1 per cent and heating at 56° C. for 1 hour, gave no evidence of possessing qualities leading to the immunization of rabbits. When this bacterin was tested on guinea pigs for toxic effects and for aggressin action neither was observed. The work is considered promising as a forerunner to the discovery of a means of preparation of a potent germ-free active immunizing agent for anthrax.

[Work with hog cholera at the Illinois Station] (*Illinois Sta. Rpt. 1927*, pp. 88-90).—A brief reference is made to hog cholera studies conducted by E. Roberts and W. E. Carroll, in continuation of those previously noted (E. S. R., 56, p. 379). Eighteen pigs from sows and boars previously selected as being resistant to hog cholera succumbed after being subjected to the hog cholera virus. The test was much more severe than the pigs would probably get under field conditions, since they were given a subcutaneous injection of virus, a dose by mouth, and kept in contact with a pig with a very virulent case of cholera.

Studies for the fifth year by R. Graham, E. A. Tunnicliff, and E. C. McCulloch failed to show that the pig's age at time of treatment influenced the period of immunity against cholera. Baby pigs in the station herd immunized against cholera and then tested for immunity at market age by the injection of hog cholera virus were all found resistant. It is pointed out that if found practicable immunization of baby pigs is desirable, since it reduces the amount of serum needed to less than one-half that needed after weaning. Ninety-eight pigs varying from 3 to 8 weeks of age were given serum and virus, 35 of these being given 5 cc. of hog cholera virus at 7 months of age and all remained healthy. In another group taken from the 98 pigs, a small percentage was found susceptible at market age. It is concluded that there are factors aside from age which lower the immunity established by injecting baby pigs with serum and virus, diseases other than cholera apparently playing a part in lowering the immunity. The possibility of parasitism influencing the length and strength of immunity has also been indicated in some herds.

The poultry disease program of the Third World's Poultry Congress, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen*, 16 (1927), No. 1,

pp. 4, fig. 1).—This is a brief report upon the proceedings of the poultry disease section of the Third World's Poultry Congress held at Ottawa, Can., from July 27 to August 4, 1927 (E. S. R., 57, p. 301).

[Poultry disease studies at the Pennsylvania Station], R. P. TITSLER (*Pennsylvania Sta. Bul.* 213 (1927), pp. 20, 21).—Further agglutination tests (E. S. R., 56, p. 176) were made upon the sera of 10 hens naturally infected with bacillary white diarrhea, in which antigens from 25 strains of *Salmonella pullorum* and 5 strains of *S. sanguinarum* were used. Extreme variations were found in the agglutinating ability of various strains as well as in the agglutinating strength of the sera. Antigens of both *S. sanguinarum* and *S. pullorum* were agglutinated equally well by *S. pullorum* immune sera. Some strains gave a pronounced prozone, and it appears that hemolysis greatly increases the prozone. A mixed antigen gave the best results, and it is considered doubtful whether a single strain antigen should be used in routine agglutination tests. As a preservative, 0.5 per cent formalin was satisfactory. Most of 100 strains produced hydrogen sulfide within 24 hours, but a number never have produced it.

A total of 1,681 eggs from 35 trap-nested hens, examined bacteriologically, resulted in cultures from 90 eggs. Fermentation tests indicated that 24 of the cultures were *S. pullorum*. The infection from individual hens varied greatly, 15 hens producing *S. pullorum*-free eggs while 35 per cent of the eggs of one hen were infected.

Autopsies were made during the year of 355 birds from 176 farms, of which 266 were under 1 month of age. Of these, bacillary white diarrhea was found in 72, paralysis in 24, coccidiosis in 16, oviduct ailments in 11, pneumonia and bronchitis in 10, tumors in 8, blackhead in 6, roundworms in 5, liver trouble in 5, poisoning in 4, roup in 3, tapeworms in 3, cold infections in 2, cholera in 1, vent gleet in 1, connective tissue mites in 1, air sac mites in 1, and tuberculosis in 1. Intestinal parasites are more common than this summary indicates, however, as both round and tapeworm infections can be diagnosed on the farm, and therefore usually are not sent to the laboratory. All cases of blackhead were in young chickens and caused high mortality in every instance. Severe outbreaks of bacillary white diarrhea in adult birds occurred in 4 flocks. In 60 per cent of the bacillary white diarrhea infections of chicks the lungs were either badly congested or filled with hard nodules.

The rate of absorption of yolk masses in baby chicks (*Arkansas Sta. Bul.* 221 (1927), pp. 33, 34).—It is pointed out that digestive diseases are more common among chicks in which the rate of absorption of the yolk mass is delayed, which it is suggested may be due to such causes as excessive incubation temperature, aridity, or humidity of the incubator, and infection of the embryo. With a view to determining the normal rate of absorption of the yolk mass after the chick has hatched, 35 White Leghorn chicks were kept on an unrestricted buttermilk-oatmeal diet, 15 others on a diet restricted to one-fourth the quantity per chick as in the preceding group. Necropsies were made at 3, 5, 7, and 9 days in each group and also at 14 days in the group receiving unrestricted diet, and the weights of the chicks and of the residual yolk masses determined.

The restriction of the diet did not appear to influence the rate of absorption of the yolk mass. Yolk masses encountered at 72 hours varied from 2.03 to 4.05 gm.; at 5 days from 0.43 to 1.32 gm.; at 7 days from 0.03 to 2.95 gm.; at 9 days from 0.004 to 4.80 gm.; and at 14 days from 0.001 to 0.08 gm. At 9 days two individuals out of 10 were encountered the reserve yolk in which weighed in excess of 4 gm. and one in which the weight was 0.546 gm.; the remainder had yolk masses of or of less than 0.05 gm. However, the gross weight or physical condition of the chicks was apparently not influenced by the factors which led to this variation. Moreover, the larger yolk masses were cultured and

found bacteriologically sterile. Thus, while the amount of yolk remaining at 9 to 14 days among White Leghorn chicks may usually be measured in hundredths and thousandths of a gram, it is apparent that this may be subject to considerable variation and in the light of this work can not necessarily be interpreted to have a pathologic significance.

Bacillary white diarrhea investigations (*Arkansas Sta. Bul. 221 (1927)*, pp. 31-33, figs. 3).—In agglutination tests of 3,404 birds obtained from certain sections of Arkansas, 273 reacted positively, and 709 gave cloudy reactions. In studying the cloudy reactions, 3 strains of *Bacterium pullorum* selected from 20 that had been isolated and identified were tested for pathogenicity on 3 groups of 25 72-hour chicks, the chicks being kept on a buttermilk-rolled oats diet. No infection occurred in any of the 25 chicks, although each was exposed to the infection by the oral administration of 0.5 cc. of a 24-hour culture of *B. pullorum*. It is suggested that a diet based on buttermilk may act in preventing bacillary white diarrhea in chicks, and further that many strains of *B. pullorum* have such low virulence that the elimination of all carriers may not be the economically practical means of dealing with the disease.

[**The intradermal test for bacillary white diarrhea**] (*Illinois Sta. Rpt. 1927*, pp. 127-132, figs. 2).—Studies of the intradermal or pullorin test were conducted by R. Graham, E. A. Tunncliffe, and E. C. McCulloch, it being compared with the agglutination test and post-mortem examination findings.

In work with farm flocks the pullorin test detected not less than 70 per cent and often more of the reactors to the agglutination test, and all such reactors were detected in some flocks. A total of 172 farm flocks in 12 different counties, with 27,816 chickens, were tested intradermally, of which 4,199, or 15.1 per cent, proved positive. The pullorin had been prepared in different ways, including (1) bouillon cultures killed by heat and preserved with 0.5 per cent phenol, (2) broth cultures killed by phenol, and (3) washed agar cultures of different ages destroyed by phenol, heat, and formalin. Experimental pullorins prepared on synthetic media and killed by heat and chemicals were also tested. The strains used in the preparation were isolated from fatally affected baby chicks and from the ovaries of mature hens. Powdered pullorin gave the most consistent results, but whether or not it is more potent than liquid cultures or cellular pullorins remains to be determined. It was prepared by precipitating liquid cultures of *Salmonella pullorum* in absolute alcohol, was apparently superior in keeping qualities to experimental liquid pullorin, and does not cause the formation of antibodies which interfere with the results of the agglutination test. The comparative diagnostic value of three experimental pullorins as determined by the agglutination test and autopsy findings is reported upon in tabular form. While some discrepancies were encountered, in the main the results on flocks were favorable.

In testing the chickens by the two methods, it was found that the manner of injecting the fowls as well as the skill in interpreting the reactions markedly influences the results. Different methods of injection were used, but the most important requirement noted in making the test was that a sharp needle be used, to enable the operator to place the pullorin between the layers of the skin. The proper injection of the skin of the wattle is not a simple procedure, a variation in the thickness of the wattle skin making it difficult to dispatch in every chicken. Unless it is injected intradermally the efficiency of the test, as judged by the agglutination and the gross lesions at autopsy, is decreased. The interpretation of the results also has an important influence on the correlation of the two tests. In one group of 22 chickens, observed by three persons, 16 were regarded as infected by the first person, 12 by the second, and 11 by the third, or a variation of 22.7 per cent.

The results obtained in the testing of 13 groups of chickens, a total of 576 birds, with powdered pullorin, in which different types of syringes and needles and variations in the method of injection were used, are reported upon, the observations 18 hours later being given in tabular form. Of these, 362 reacted to the pullorin test, 223 to the agglutination test, and gross lesions were found in 351. The intradermal test detected 77.1 per cent of those that reacted to the agglutination test. It is pointed out that 4.5 per cent of the infected birds, as judged by bacteriologic findings, failed to react to either test. The intradermal test, which showed 62.8 per cent reactions, detected a larger percentage of the infection than the agglutination test, to which 38.3 per cent reacted.

A preliminary study of some of the factors of variation encountered leads the authors to suggest that neither the agglutination test nor the intradermal test is a perfect procedure, but that each, if used intelligently, constitutes the best means at hand in eliminating infection in mature breeding stock. It is concluded that the results of the intradermal test are quite as consistently in accord with the presence or absence of the infection as compared with the agglutination test, and that the discrepancies encountered between the two tests, as judged by diseased ovaries and bacteriologic findings, might center around the personal factor involved.

[Resistance of chicks to bacillary white diarrhea] (*Illinois Sta. Rpt. 1927, pp. 132, 133*).—Brief reference is made to work under way on the resistance of chicks to bacillary white diarrhea by E. Roberts and L. E. Card in continuation of that previously noted (*E. S. R., 56, p. 381*). Among chicks from selected stock 55 per cent lived, while among chicks from unselected stock only 10.1 per cent survived after inoculation. In stock selected for one generation 48 per cent survived, while in stock selected for two generations 60 per cent survived.

Dry skim milk tried for control of coccidiosis (*Illinois Sta. Rpt. 1927, p. 146*).—Feeding tests conducted in six flocks with a view to determining the value of powdered skim milk in controlling coccidiosis were supervised by R. Graham, E. A. Tunnickliff, and E. C. McCulloch. The dry skim milk was fed in a dry mash composed of 40 parts of powdered milk and 60 parts of dry mash, the usual sanitary measures being employed. While it was difficult to measure accurately the therapeutic value of dry milk the results were generally favorable.

Studies of the cataphoresis and agglutination of *Salmonella pullorum*, M. W. LISSE (*Pennsylvania Sta. Bul. 213 (1927), p. 5*).—Studies made of the relationship between the amount of electrical charge and the agglutination capacity of 19 strains have shown that the species *S. pullorum* is electronegative to water or 0.85 per cent sodium chloride in which it is suspended, provided the pH is near neutrality, and that the Northrop type of cell gives accurate results. The addition of methylene blue to the zinc sulfate electrode solution makes observation easier and thus prevents an excess from going into the cell proper. Variations existing in the agglutinating ability of various strains of a species are due to the fact that some strains carry a greater charge than others. Those strains having a high negative charge are agglutinated with difficulty, while those carrying a comparatively low charge agglutinate with ease.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Arkansas Station] (*Arkansas Sta. Bul. 221 (1927), pp. 5-7, fig. 1*).—In plow draft tests under several soil conditions very little difference was found in the draft per square inch within the range of cut of from 10 to 30 in. in width. With but one exception the draft was heaviest in cotton stubble and lowest in soy beans. Cowpea stubble

and sod were intermediate. In 275 tests it was shown that the draft per square inch of furrow section is inversely proportional to the depth of cut.

In an analysis of the use of machinery in cotton production the conclusion was reached that power and labor represent about two-thirds of the cost of production and offer an opportunity for critical study of methods.

In studies of the durability of posts (E. S. R., 56, p. 381), it was found that oak posts butt treated with hot and cold creosote baths were still fit for service after 4 years. After 6 years with the same treatment, however, 16.8 per cent were rotted off. Of green oak posts treated 2 hours by the open tank process 23 per cent were rotted after 3 years. Painted steel posts were rusted after 4 years but still serviceable, while galvanized steel posts were in good condition.

Data on the number, size, and duty of tractors on rice farms are also included.

[Agricultural engineering studies at the Illinois Station] (*Illinois Sta. Rpt. 1927, pp. 204-222, figs. 6*).—The progress results of a number of agricultural engineering studies are presented and discussed (E. S. R., 56, p. 382).

In connection with experiments conducted by E. W. Lehmann and F. C. Kingsley on the power consumption of electrically operated machines, data are reported on the total monthly energy consumption on 10 farms.

With reference to farm septic tanks, the results of a five-year study by Lehmann and R. C. Kelleher indicate that a 2-chamber septic tank will give the best results.

In the study of horse hitches, A. L. Young found that tractor plows can be pulled with horses satisfactorily. Apparently the tying-in and bucking-back system of driving can often be used to advantage on smaller tandem teams.

In a study of underdrainage in tight clay soils by Lehmann, F. P. Hanson, and Kelleher in cooperation with the U. S. Department of Agriculture, it was found that laterals were quite effective in lowering the elevation of the ground water table when spaced 66 ft. apart, but when spaced 132 ft. apart were not effective midway between the tile lines.

In tests of soy bean harvesting with combines, by Lehmann and I. P. Blausner, the importance of cutting close to the ground in order to reduce the loss of soy beans to a minimum was established. A tremendous loss was shown when the soy beans were cut as high as 6 in. above the ground.

In studies of corn drying by Lehmann, Kelleher, W. L. Burlison, and G. H. Dungan, no advantage was indicated in using temperatures of more than 150° F. The most economical temperature for evaporation was found to depend to a certain extent upon the design of the drying plant, the kind of fuel and power used, and the relative costs of fuel and power. From checks made on the germination of corn it appeared best to keep the drying temperatures for seed corn 10° or more below 125° for best results. The data indicate that a temperature of 190° is distinctly harmful, and there is a suggestion that a drying temperature of from 130 to 150° may be injurious. When the grain was dried to 12.5 per cent or less of moisture, the cobs were found to contain a smaller percentage of moisture than the grain. This is taken to indicate that the materials in the grain exert more pull on the moisture than do the materials in the cob.

Stream gaging, W. A. LIDDELL (*New York and London: McGraw-Hill Book Co., 1927, pp. XIV+238, figs. 137*).—This book contains chapters on the flow of water in rivers, distribution of velocities in open channels, stream gauging

stations, gauges, channel area, floats and float measurements, current meters, rating the current meter, current meter characteristics, current meter measurements, slope and weir measurements, construction and use of station rating curve, and effects of ice on stream flow.

Cost estimation of irrigation works, R. B. VAN HORN (*Wash. Univ. [Seattle], Engin. Expt. Sta. Bul. 39 (1926), pp. 61, pl. 1, figs. 32*).—This bulletin contains sections on the status of irrigation; economic problems of irrigation; water supply and water rights; the cost report, diversion works, and main canal system; the cost report, distribution system; and operation and maintenance. An appendix is included giving examples of estimating designs, tables, and suggested canal structures.

Use of dynamite for deep tillage, J. S. COLE (*U. S. Dept. Agr., Tech. Bul. 17, (1927), pp. 21-25, fig. 1*).—The results of a deep tillage experiment with dynamite on gumbo soil conducted at the U. S. Dry-Land Field Station, Ardmore, S. Dak., from 1913 to 1920, inclusive, are reported, leading to the conclusion that no increase of yields can be expected either as an immediate or after effect of the use of explosives on this soil.

Road support vs. road use, H. R. MOORE (*Ohio Sta. Bimo. Bul., 12 (1927), No. 6, pp. 189-193*).—Data are given on distribution of road costs, road utilization, and origin of motor vehicle traffic in Ohio. From 1921 to 1925, "the 28 per cent of Ohio's population that live outside incorporated territory supplied less than one-half of the motor vehicle traffic on country roads and contributed an approximate one-half of the revenue."

The fatigue of metals, H. F. MOORE and J. B. KOMMERS (*New York and London: McGraw-Hill Book Co., 1927, pp. XI+326, pls. 2, figs. 102*).—This book summarizes the more important experimental facts concerning the strength of metals under repeated stress, reviews briefly the more important of the current theories of fatigue of metals, and briefly describes apparatus and methods used in making an experimental study of the subject. It contains chapters on stress and strain in metals—the accuracy of the ordinary concepts of elastic action; historical survey up to 1919—fundamental concepts; slip, overstrain, and hysteresis; fracture under repeated stress; testing machines and specimens for fatigue tests of metals; characteristic results for fatigue tests; the effect of range of stress on fatigue strength; "stress raisers" and their effect on fatigue strength—stress and corrosion; fatigue failure under service conditions; fatigue of wood; and fatigue of cement and concrete. A bibliography is included.

The growing use of high-speed machinery in agricultural practices makes this book one of special importance to agricultural engineers.

Influence of rust-film thickness upon the rate of corrosion of steels, E. L. CHAPPELL (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 464-467, fig. 1*).—Studies conducted at the Massachusetts Institute of Technology are reported which showed that a very thick film of rust is required to decrease appreciably the corrosion rate of copper bearing steels, and that the more easily corroded steels have a much longer life when protected by even a thin film of corrosion product. This indicates the conditions under which copper bearing steels under water would not be superior to ordinary steel. On the other hand, it was found that where the rust film is removed copper bearing steels are likely to be more resistant. In addition it is concluded that the common practice of cleaning the rust accumulations from iron surfaces, such as inside water heaters and tanks, is likely to increase greatly the attack on the metal. In cases of heavy metals, such as cast iron, a thick film may be allowed to build up and corrosion be practically stopped.

The theory and practice of modern framed structures.—Part I, **Stresses in simple structures**, J. B. JOHNSON, C. W. BRYAN, and F. E. TURNAURE (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 10. ed., rev., pp. XIV+356, figs. 288*).—This is the tenth revised edition of part 1 of this work.

Design of concrete structures, L. C. URQUHART and C. E. O'ROURKE (*New York and London: McGraw-Hill Book Co., 1926, 2. ed., pp. 1X+501, figs. 217*).—This is the second edition of this book (E. S. R., 51, p. 187).

A laboratory method of determining the starting properties of motor fuels, W. G. LOVELL, J. D. COLEMAN, and T. A. BOYD (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 389-394, figs. 11*).—A laboratory method of determining the readiness with which an explosion may be obtained with any given fuel at the temperatures desired is described, which consists in measuring directly the air-fuel ratio necessary to produce an explosive mixture at any given temperature. Its application to the testing of a considerable number of fuels of widely different properties over a broad temperature range was found to yield results that are comparable with those obtained in starting tests on actual engines.

It was found that the effective starting volatility of a fuel does not change with the temperature similarly for all gasolines. This is taken to indicate the importance of making determinations of the effective starting volatility at somewhere near the temperatures that will be encountered in the actual starting of engines.

There appeared to be no direct relationship between the dew point of a fuel and its starting characteristics as determined by the experimental method. It was also apparent that there may be a considerable difference in volatility between two gasolines having almost identical distillation curves. The data are taken to indicate that distillation curves of the Engler type can not be of sufficient accuracy to make dependable estimations of relative volatility, especially at low temperatures.

The quantitative effect of engine carbon on detonation, N. MACCOULL and D. B. BROOKS (*Jour. Soc. Automotive Engin., 21 (1927), No. 1, pp. 59-63, figs. 7*).—Studies are reported from which the conclusion is drawn that in making detonation tests carbon deposits should not be removed frequently, but that the engine should operate as much as possible under constant conditions. Tests should not be made immediately after removing the carbon, since the primary objection to carbon is its tendency to increase detonation. Carbon deposit tests should be superseded by detonation tests which will indicate the detonation inducing tendency of the carbon deposit. The effect of engine carbon is to increase detonation in proportion to the greatest thickness of carbon existing over any considerable area.

Engine-acceleration tests, J. O. EISINGER (*Jour. Soc. Automotive Engin., 21 (1927), No. 2, pp. 184-192, figs. 12*).—This is a progress report of work being done at the U. S. Bureau of Standards on internal-combustion fuels. The author first considers the general subject of engine acceleration and describes the test equipment and procedure used in the investigations. With reference to the degree of accuracy essential in such tests, attention is drawn to the determination of a change in engine torque of the order of 1 lb.-ft. if a tachometer or a chronograph is used to determine acceleration. In this connection the smallest change in engine speed that could be detected by the equipment used was 2.5 r. p. m. per second, which is equivalent to a torque of about 2 lb.-ft.

The first series of engine tests consisted of a comparison of the maximum acceleration obtained with three different carburetors used without accelerating wells. One carburetor was of the plain tube type and the other two of the

air valve type. These acceleration tests covered a speed range of from 250 to 1,000 r. p. m., and showed that the most important and pronounced lag in acceleration always occurs during the time the engine speed is increasing from 250 to 350 or 450 r. p. m. It was found that different carburetors may give marked differences in performance under normal temperature conditions. The plain tube type carburetor gave the best performance and the most consistent results. It appeared that the temperature of the cylinder walls has very little effect on the acceleration obtained. The acceleration obtained under a given set of conditions was found to be largely dependent upon the temperature of the intake manifold. With the particular gasoline used, an intake manifold temperature below about 78° C. (172° F.) caused a decided lag in the acceleration of the engine. The least lag in acceleration was found to occur when operating with rich mixtures.

The injection of various amounts of accelerating charge ceased to improve acceleration only in case the idling mixture was excessively rich. With a very rich carburetor setting the mixture delivered to the engine cylinders immediately after the throttle is opened may not become lean enough to affect acceleration materially, but such an adjustment gives a very high average fuel consumption. No consistent or significant difference attributable to the location of the accelerating jet could be detected when using the same quantity of accelerating charge.

Data are also presented on effect of sudden throttle opening and on flow of liquid in the intake manifold.

Dynamometer test of brake-drum heat in dual wheels, C. W. BEDFORD and E. BLAKER (*Jour. Soc. Automotive Engin.*, 21 (1927), No. 2, pp. 160-170, figs. 15).—Comparative tests made of two disk truck wheels, one 20 in. and the other 24 in. in diameter, and of two 20-in. steel spoke wheels, are reported. Two cast-steel brake drums were also used in the tests, which were similar in all respects except that one had surface corrugations extending from the flange part way across the outside of the drum and the other had substituted for these corrugations a strip of packing $\frac{3}{4}$ in. thick.

A comparison of the four wheels on the basis of constant brake horsepower showed a wider difference in the same order than a comparison on the basis of constant brake drum temperature. It appeared that the greater the cooling action of a given wheel the greater is the error in comparing this with other wheels on the basis of constant brake drum temperature, and the greater is the necessity of a comparison on the basis of constant brake horsepower.

The cooling properties of a wheel were found to increase with the speed of rotation for a given brake horsepower input, and variations in speed did not materially change the relative cooling action of the three 20-in. wheels. Forced ventilation by external fans was found to be an aid in the dissipation of brake drum heat.

It is concluded that the tire trouble known as "burned beads" can not result from heat due to tire flexing, but must be attributed to brake drum heat caused by dragging brakes or excessive use of brakes. Excessive flexing in a tire due to under inflation, heavy loading, or high speed will accentuate the effect of brake drum heat on the bead by decreasing the temperature gradient between the bead and tread.

Oil-flow through crankshaft and connecting-rod bearings, D. B. BROOKS and S. W. SPARROW (*Jour. Soc. Automotive Engin.*, 21 (1927), No. 2, pp. 127-134, figs. 12).—Data are presented relating to the factors governing the flow of the lubricant through crank shaft and connecting rod bearings. Apparatus for measuring the flow is described, and emphasis is placed on the fact that it

permits measurement under operating conditions. Centrifugal force is shown to have a major influence on flow at high speeds, but it is pointed out that the magnitude of this influence can be controlled to a considerable extent by the radial location of the oil hole in the crank pin.

A study of petroleum lubricants, C. F. MABERY (*Indus. and Engin. Chem.*, 19 (1927), No. 4, pp. 526-529).—Studies conducted at the Case School of Applied Science are reported.

Two oils subject to heavy use were examined as to specific gravity, viscosity, and behavior on a frictional bearing, and were found to have undergone little deterioration. Oils with the same viscosity showed wide variations in fractional tests. A series of medium grade lubricants with viscosity of 320 seconds at 38° C. gave a maximum difference of 12 seconds at 98°, of 27 seconds at 54.4°, and corresponding differences in results on the frictional bearing.

Efficiency test for radiator-fan-type air-cleaners, A. H. HOFFMAN (*Jour. Soc. Automotive Engin.*, 21 (1927), No. 1, pp. 82-86, figs. 6).—The progress results of studies being conducted at the California Experiment Station are reported. In the course of these experiments a special method of testing air cleaners of the radiator fan type was found necessary, in which the air cleaner is mounted in its normal position behind a radiator fan located inside of an elliptical wind tunnel within which the fan circulates air. A tractor engine running at constant speed and load drives the fan and draws the air for its carburetor from the wind tunnel through the air cleaner under test and from an absolute air cleaner connected in series.

When a 100-gm. charge of a standardized dust was introduced into the wind tunnel, by averaging the results obtained from repeated tests and using three different collecting-type dry centrifugal air cleaners, it was found that under normal conditions 15 per cent of the total dust charge actually reaches the air cleaner under test in the apparatus. With one exception, the air cleaners tested showed rather low efficiency. The vacuum or restriction effects were found to be low, and were unaffected by accumulation of dust except in two cases.

A southern rural rate, E. W. ASHMEAD (*Elect. World*, 90 (1927), No. 12, pp. 562-566, fig. 1).—This rural electrical rate is outlined in detail in the form of a graduated service charge based on customer density, with a low energy charge. Rural customers are classified into four density groups, and provision is made for seasonal features.

Two-year record of farm service, R. BOONSTRA (*Elect. World*, 90 (1927), No. 12, p. 568, fig. 1).—An analysis of electrical energy consumption and connected loads on 2,297 Illinois farms is graphically presented.

Power and labor studies (*Pennsylvania Sta. Bul.* 213 (1927), p. 23).—It is reported by H. B. Josephson that in potato growing the labor required in picking the potatoes off the ground and loading them into a wagon was found to be over 40 per cent of the total labor requirement for producing the crop. It was also found that the amount of plowing accomplished with tractors in stony fields was less than two-thirds of that done in fields where there were only a few rocks.

Some studies of infiltration of air through windows, A. C. ARMSTRONG (*Jour. Amer. Soc. Heating and Ventilating Engin.*, 33 (1927), No. 7, pp. 423-433, figs. 8).—Studies are reported which were concerned principally with the problem of the infiltration of air through windows, and a review of the work of others bearing on features of the subject is included. The studies were devoted primarily to typical metal windows, including 17 different types. The results are presented both graphically and in tabular form, but no conclusions are drawn.

An outline of sewage purification studies at the Lawrence Experiment Station, H. W. CLARK (*Indus. and Engin. Chem.*, 19 (1927), No. 4, pp. 448-452).—The studies in progress at the station on sewage purification are outlined and discussed briefly.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in rural economics and sociology at the Arkansas Station] (*Arkansas Sta. Bul.* 221 (1927), pp. 11-15, fig. 1).—The results of investigations not previously noted are reported as follows:

[*Farm taxation.*].—State, county, and local taxes and road district assessments for 1921-1925 averaged 18.1 per cent of the net rent of 147 farms studied. Drainage, levee, and other special assessments took an additional 9 per cent. The ratio of taxes to property earnings was slightly higher for farm real estate than for city real estate and banks, and considerably higher than for some public service corporations.

[*Farm income and standard of living.*].—A survey was made of approximately 1,030 farms in 1925-26 and about 400 farms in 1926-27. Size of business was found to be one of the more important factors in determining profits. The largest single factors in the organization of the farm business affecting profit in the order of their importance were yield of cotton per man, units of productive work per man, acres of crops per man, percentage of land in cash crops, crop yields, and percentage of capital in equipment. Tenure was not found to be an important factor.

[*Farm organization and cost of production.*].—The costs of production in 1926 on 15 farms each in Hempstead and Nevada Counties were, respectively, 16 and 11.7 cts. per pound of lint for cotton, and 97 cts. and \$1 per bushel for corn. The cash receipts per farm averaged \$1,196, of which \$1,015 came from cotton. A chart is given showing the distribution by months of man labor on the Nevada County farms.

[Investigations in farm organization and management and agricultural economics at the Illinois Station] (*Illinois Sta. Rpt.* 1927, pp. 69-73, 161, 165-204, figs. 12).—The results obtained during the year are summarized.

[*Livestock shipping associations*, R. C. Ashby] (pp. 69-73).—Data on operations in 1925 were obtained from 434 different associations. The total home, or local, expenses per hundredweight in 309 of the associations varied as follows: Seven associations 5 cts. or less, 27 associations 5 to 7 cts., 80 associations 7 to 9 cts., 104 associations 9 to 11 cts., 46 associations 11 to 13 cts., and 45 associations 13 cts. or more. No definite relation was apparent between amount of business and home expense. Of 422 associations, 128 shipped 25 or less cars during 1925, 115 shipped 26 to 50 cars, 116 shipped 51 to 100 cars, 47 shipped 101 to 200 cars, 13 shipped 201 to 400 cars, and 3 shipped 401 or more cars. At least a car a week was believed necessary by managers to provide a service capable of attracting and holding patrons. The problems of first importance in the associations were found to be to get increased activity and better service by boards of directors, to arouse interest and maintain support of members, to get and keep competent managers, to increase volume of business, to reduce shipping expenses, to improve records and accounts, to study direct marketing, to adopt member contracts, and to adapt trucking to association operation.

[*Milk marketing*, C. A. Brown] (p. 161).—It was found that experienced milk dealers, using large outlays of capital and highly efficient methods, generally must be satisfied with a profit of less than 0.5 ct. per quart. Four cents per quart is given as a conservative average for delivery expense in the Chicago district. The loss from surplus milk also consumed a considerable portion of

the dealer's spread, the surplus carried by some dealers being as high as 33 per cent.

[*Farm organization and management*, H. C. M. Case and M. L. Mosher] (pp. 165-169).—Tables are given summarizing the 1926 records and showing the important factors affecting the earnings on 210 of the 239 farms in the cooperative farm bureau-farm management service project, previously noted (E. S. R., 56, p. 385). After paying all expenses and allowing \$720 as the value of the operator's labor, the average return on the total farm investment was 2.8 per cent for the 210 farms, 6.28 per cent for the 42 most profitable farms, and —0.01 per cent for the 42 least profitable farms. Per acre, the 42 most profitable farms compared with the 42 least profitable farms had \$14.85 higher income; \$1.06 less expense; 8.8, 7.9, and 7.2 bu., respectively, higher yields of corn, oats, and wheat; \$3 higher investment in and \$8.97 higher return from productive livestock; \$55.14 greater return per \$100 worth of feed fed; 1 ct. greater man labor expense; 72 cts. less cost of horse and tractor power and machinery; and \$53.85 less expense, including interest on investment, for each \$100 of receipts.

[*Farm earnings*, H. C. M. Case, R. R. Hudelson, P. E. Johnston, and H. A. Berg] (pp. 169-182).—Business records from about 1,200 farm accounts for 1926 obtained under the project previously noted (E. S. R., 56, p. 385) are summarized by areas. A table is given showing by sections and counties the investment per acre and the rate earned on investment in 1925 and 1926 on the farms from which accounts were obtained, and a map showing the average rates earned in 1924, 1925, and 1926 in different farming type areas of the State. The average rate of earning on the 1,200 accounting farms in 1926 was about 0.7 per cent less than the 1925 average. The average rate of earning on investment for all farmers of the State in 1926 is estimated at 2.3 per cent, compared with 4.5 and 3.3 per cent, respectively, in 1924 and 1925. Further investigations during 1926 showed that on the average the account-keeping farmers earned about 1.7 per cent more on their investment than did farmers as a whole.

[*Cost of production and profitableness of crops*, H. C. M. Case, R. H. Wilcox, H. A. Berg, and J. B. Andrews] (pp. 183-187).—The average net cost per bushel or ton and the average net profit or loss per acre of field crops for the years 1923, 1924, and 1925 in Knox and Warren Counties were found to be as follows: Corn 54 cts. and \$6.70, oats 38 cts. and —\$1.46, barley 77 cts. and —\$4.15, spring wheat \$1.45 and —\$7.81, winter wheat \$1.11 and —\$1.17, timothy \$14.60 and —\$1.39, mixed hay \$16.86 and —\$3.30, clover \$11.86 and \$1.92, alfalfa \$10.22 and \$16.64, soy bean hay \$19.44 and —\$12.62, and oat hay \$15.87 and —\$4.58. The costs and profits in Champaign and Platt Counties in 1926 were for corn 52 cts. and —\$1.21, oats 52 cts. and —\$7.33, wheat \$1.30 and —73 cts., soy beans threshed \$1.84 and —\$7.36, soy bean hay \$19.18 and —\$6.50, and timothy \$14.31 and \$2.29.

[*Farm power costs*, R. C. Ross, J. B. Andrews, and R. I. Shawl] (pp. 187-190).—The farm tractor and horse labor cost studies previously noted (E. S. R., 56, p. 385) were continued in Clinton County, selected as representative of the wheat and dairy section of the State. The average annual cost of operating 2-plow tractors was found to be \$224.22 for 250 hours of use, and for 3-plow tractors \$339.32 for 301 hours of use. The cost of horse work on 15 farms studied in Champaign and Platt Counties in 1926 was 13.2 cts. per hour, with an average of 789 hours per horse per annum. The averages for the chief items of cost for the several years from 1920 to 1926, inclusive, and for the several farms in 1926 are given.

[*Pork production costs*, R. H. Wilcox and H. P. Rusk] (pp. 191-194).—The data obtained from 34 farms in 1924 and 36 farms in 1925 in McLean and Woodford Counties are summarized. The cost of producing 100 lbs. of pork and the price of corn per bushel were found to be as follows: 1924, 1-litter farms \$9.79 and 94 cts., 2-litter farms \$9.55 and 96 cts.; and 1925, 1-litter farms \$8.64 and 79 cts., 2-litter farms \$8.77 and 78 cts. The sales weights of pigs on 1-litter farms were 230 lbs. in 1924 and 211 lbs. in 1925, and on 2-litter farms the weights were 192 lbs. in 1924 and 208 lbs. in 1925. The average cost of carrying a sow for one year's production, the average number of pigs weaned per sow, and the average cost of a weaned pig were \$20.67, 5.3, and \$3.90, respectively, in 1924, and \$22.68, 5.7, and \$3.98, respectively, in 1925 on 1-litter farms; and \$31.50, 8.4, and \$3.75, respectively, in 1924, and \$34.05, 9.8, and \$3.47, respectively, in 1925 on 2-litter farms.

[*Marketing soy beans*, C. L. Stewart, O. L. Whalin, and L. F. Rickey] (pp. 195, 196).—The acreage of soy beans for seed increased 51 per cent and that for hay 2 per cent from 1925 to 1926. It is estimated that about 30 per cent of the 1926 crop was used for seed in the State, 30 per cent for seed outside of the State, 20 per cent for feed on farms, and 20 per cent by oil mills. Prices tend to increase gradually from harvest until about the middle of the following April.

[*Wheat marketing*, C. L. Stewart, L. J. Norton, and L. F. Rickey] (p. 196).—Approximately 20 per cent of hard red winter and soft red winter wheat from Illinois farms received at terminal markets is mixed and brings an average of about 2 cts. per bushel less than clear wheat. From certain counties in the central part of the State, 30 per cent or more of the shipments are graded as mixed.

[*Shipments of grain*, C. L. Stewart, L. J. Norton, and L. F. Rickey] (pp. 196-199).—The rate at which the various grains moved to market varied somewhat in different sections of the State, but for the State as a whole 70 per cent of the shipments were made between July 1 and September 30. The cost of moving grain to consuming centers, location of manufacturing plants, and storage facilities to handle seasonal movements were found to be the principal factors influencing the destination of grain shipments. No extreme differences were found, so far as the seasons of shipments were concerned, between farmers' companies and privately owned elevators, except a tendency for the latter to ship a slightly higher percentage at harvest time.

[*Terminal grain markets*, L. J. Norton] (pp. 199, 200).—The average elevator capacity reported for Chicago decreased from 57,300,000 bu. in 1905-1909 to 52,500,000 bu. in 1922-1926. The average percentage of reported capacity that the reported holdings for the period 1912-1923 would have filled varied from 45 in March to 21 in July, averaging 35; and for the period 1924-1926 from 62 in March to 33 in August, averaging 52. The higher percentages in the latter period indicate an accumulation in storage centers at various times during those years, more than 80 per cent of the capacity being filled during one month of the period.

[*Prices of farm products*, L. J. Norton] (pp. 200-204).—A table is given showing the relative prices of corn, oats, hay, wheat, cattle, hogs, butter, eggs, and chickens for the period from July, 1909, to June, 1914; for the period 1921-1926; for 1926; and for the first six months of 1927. The replacement of horses by automobiles, trucks, and tractors, the decline in the commercial consumption of corn meal, and the replacement of corn by molasses in the production of alcohol were factors causing the relatively low prices of feed crops, as compared with the products nearest to the consumer, such as butter, eggs,

and chickens. Variations in the size of the corn crop and in the number of hogs were found to be two of the most important factors affecting the price of corn. The years 1900-1915 grouped on a basis of the size of the corn crop and the size of the pack of hogs showed the following ranges and average prices of April corn, using the average price for the period equal to 100: Short corn crops and large hog packs, range 113 to 135, average 121; short corn crops and small hog packs, range 90 to 103, average 97; large corn crops and large hog packs, range 81 to 98, average 92; and large corn crops and small hog packs, range 78 to 88, average 84.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul.*, 12 (1927), No. 6, pp. 188, 189, 194-198, figs. 2).—Investigations are reported as follows:

A comparison of Ohio and New York egg prices, V. R. Wertz (pp. 188, 189).—A table and chart are given showing by months from 1922 to 1926, inclusive, the average price of eggs on Ohio farms and in New York City. The New York City prices exceeded the Ohio farm prices by from 4 to 5.6 cts. for the months January to June, 3 to 4.2 cts. from July to September, 0.8 ct. in October, and 1.6 cts. in December. The Ohio November price was 0.8 ct. higher.

Land utilization in Ohio, J. I. Falconer (p. 194).—A map is given showing the shift by counties in the acreage of crops other than hay between 1910 and 1924.

Competition with apples in Ohio markets, C. W. Hauck (pp. 195-197).—A table is given showing the yearly car unloads of apples and the 15 other leading fruits and vegetables in Cincinnati and Cleveland from 1918 to 1926, and in Columbus and Toledo from 1923 to 1926.

Index numbers of production, wages, and prices, J. I. Falconer (p. 198).—The table previously noted (E. S. R., 57, p. 883) is brought down to August, 1927. The series of index numbers of farm land values previously used is replaced by a series of Ohio farm real estate values, which covers both land and improvements.

[Investigations in agricultural economics at the Pennsylvania Station, 1927] (*Pennsylvania Sta. Bul.* 213 (1927), pp. 8, 9, 10).—The results of investigations not previously noted are given.

The marketing of poultry products, F. F. Lininger.—The study indicates that the annual per capita consumption of eggs in Pittsburgh, York, Uniontown, Erie, and Pottsville varied from 26.95 to 32.4 doz. From July, 1925, to June, 1926, farmers received the following average price per dozen: From consumers 51.9 cts., from city wholesalers 43.5 cts., from hucksters 40.8 cts., and from country stores 39.4 cts. The farmers' marketing costs per dozen were 4.3, 4.74, 0.58, and 1.86 cts., respectively, for the different kinds of sales.

Farm tenancy in Pennsylvania and forms of leases and contracts, J. E. McCord.—Records of 236 actual farm leases in 13 counties were obtained during 1926. About 60 per cent of such leases were oral, 197 were for one year only, and 6 for three years or more. The prevailing systems of renting differed widely between counties.

Milk marketing in Pennsylvania, R. W. Bartlett.—The average costs of operating 52 county shipping stations in the Pittsburgh, Philadelphia, New York, and Scranton milk markets varied from 9.3 to 53.2 cts. per 100 lbs. of milk, averaging 21.7 cts.

Farm mortgage debt in Iowa, W. G. MURRAY and F. L. GARLOCK (*Iowa Sta. Cur. Econ. Ser. Rpt.* 6 (1927), pp. 15).—This publication gives the results of a study of the mortgage history from 1915 to 1925 of the farm lands in 13 townships in 6 counties of the State. About 5,000 mortgages were studied, and

the townships selected were considered representative of the different soil and climatic conditions of the State, the high and low priced lands, and the different types of farming. Tables with explanatory text are included showing for the years 1915-1925 the outstanding farm mortgage indebtedness; the amount of mortgages recorded and released; the acreage mortgaged, its percentage of all lands, and the debt per acre; purposes for which loans were made; sources of funds for payment of mortgage debts; amounts loaned by different types of lenders on first and other mortgages; and the number of foreclosures, acreage foreclosed on, and judgments rendered. Tables are also included giving data as to the number of farms, acreage, and indebtedness where settlements were made from 1920 to 1925 or excessive indebtedness remained on January 1, 1926, and grouping the distressed farms according to the amount of indebtedness.

The development of agriculture in New Jersey, 1640-1880, C. R. WOODWARD (*New Jersey Stat. Bul.* 451 (1927), pp. 321, figs. 70).—This is a monographic study in agricultural history made "to determine, to describe, and in some degree to evaluate, the educational influences, both formal and informal, that have affected the development of agriculture in New Jersey." The successive chapters deal with agricultural progress in early colonial times, agricultural leaders in the eighteenth century, early agricultural fairs and societies, the beginning of an agricultural literature—almanacs, the newspaper as an educational agency, agricultural periodicals, James J. Mapes and his school, agriculture in the schools, local societies and clubs, agricultural legislation and the New Jersey State Agricultural Society, the New Jersey State Board of Agriculture, other State agricultural organizations, the State College of Agriculture, the foundation of the agricultural experiment station, and education and agricultural progress—a review.

Systems of livestock farming in the Black Prairie Belt of Alabama and Mississippi, M. A. CROSBY and R. D. JENNINGS (*U. S. Dept. Agr., Farmers' Bul.* 1546 (1927), pp. II+34, figs. 9).—The soils and the present land utilization and farm organization in the Black Prairie Belt of Alabama and Mississippi are described. The possibilities for agricultural readjustment in the section through increased production of market hay, expansion of the dairy industry, and the production of beef cattle, hogs, poultry, and sheep, especially early lambs, are discussed. Suggested farm organizations and cropping systems are outlined for different sized farms with dairying and with beef cattle as the principal enterprise.

Type-of-farming areas in North Dakota, R. E. WILLARD and O. M. FULLER (*North Dakota Sta. Bul.* 212 (1927), pp. 268+[6], figs. 173).—This bulletin includes 167 maps, charts, and diagrams and 23 tables presenting by counties data as to topography, soil, climate, land utilization, land values, tenancy, size of farms, crop acreages and yields, livestock, and farm incomes, and making comparisons of conditions at different dates since 1900.

The data indicate that the State may be divided into 14 areas of one or more counties which differ sufficiently agriculturally to be segregated and their characteristics defined. Maps are given showing these areas, and for each area the trends per farm in acreages of wheat and flax from 1909 to 1926, in cattle and hog production from 1910 to 1925, and in butterfat production from 1909 to 1924. A table is also given showing the total acreage, cropped acreage, acreage in pasture, percentage of cropped acreage in different crops, and the number of different kinds of livestock on the most common size and type of farm in each of the farming type areas.

This bulletin was prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Economic aspects of the dairy industry, E. C. VOORHIES (*California Sta. Bul. 437 (1927), pp. 192, figs. 44*).—This bulletin presents the results of a study the object of which was to analyze the chief statistical data available regarding the dairy industry. Included are 104 tables and 44 charts, maps, and diagrams presenting and analyzing the data for periods of various lengths for the world, the United States, States and sections of the United States, California, and counties and sections of California regarding the development of the industry and its distribution and importance in the United States and California; the production, manufacture, distribution, storage, and consumption of dairy products; the prices and purchasing power of and the domestic and foreign trade in dairy products; the production, consumption, and price of oleomargarine; the cost factors in milk production; bovine tuberculosis; and other phases of the dairy industry.

Factors affecting returns from the dairy enterprise in the Shenandoah Valley, J. J. VERNON, C. W. HOLDAWAY, M. EZEKIEL, and R. S. KIFER (*Virginia Sta. Bul. 257 (1927), pp. 87, figs. 16*).—The results are given of a study, made in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Dairy Industry, of the effects of different methods of farm management and practices on the returns from dairy farms in Augusta and Rockingham Counties, Va. Records for the year ended April 30, 1925, were secured from 119 dairy, 26 crop-dairy, 23 beef-dairy, 8 hog-dairy, 41 poultry-dairy, and 3 truck-dairy farms, all with five or more cows, and 28 small dairy or general farms with less than five cows. Records were also obtained from 25 beef and 14 poultry farms. The records obtained included inventories of farm property; acreage, yield, and disposal of crops; breeding of dairy herd; kind and quality of feeds fed; milk produced; and itemized statements of all receipts and expenditures. The data were compiled and analyzed for each farm, and tables are included summarizing the data for each type of farm.

Livestock was found to be the largest income producer, and the productive efficiency of livestock was the most important factor affecting net farm earnings. Crop yields were next in importance, but less than half as important as livestock. Real estate values were of some importance, but total acreage in crops, acreage in individual crops, and dairy and beef animal units were of but slight importance. The following table shows the combined effect found of crop yield and livestock efficiency on earnings:

Combined effect of crop yield and livestock efficiency on operator's earnings

Productivity of livestock—per cent of average	Productivity of crops—per cent of average			
	25	50	100	150
50.....	Earnings —\$1,110	Earnings —\$830	Earnings —\$350	Earnings \$190
100.....	—30	150	630	1,170
150.....	670	850	1,330	1,870
200.....	1,330	1,510	1,990	2,530

The operator's earnings on the 44 best of the 220 dairy farms ranged from \$1,161 to \$4,624, averaging \$1,777, and on the 44 poorest farms the losses ranged from \$35 to \$2,500, averaging \$467. The more important differences between the best and the poorest farms were size of business; acreage of improved land, crops, and open pasture; larger per acre yields of corn, oats, and legume crops; larger proportion of silage and legume crops; cropping system followed; larger number of cows, young dairy cattle, sheep, lambs, and poultry;

productive capacity of the dairy cows; rations fed and nutritive ratio; crop sales through feeding livestock; and efficient use of machinery, man labor, and horse work.

Practices responsible for variations in physical requirements and economic costs of milk production on Wisconsin dairy farms, M. J. B. EZEKIEL, P. E. McNALL, and F. B. MORRISON (*Wisconsin Sta. Research Bul. 79 (1927)*, pp. 55, figs. 6).—The study reported in this bulletin is based upon 180 survey records for 1920–21 obtained in Walworth County, and 95 route records for 1922–23 obtained in Washington and Walworth Counties, Wis.

The first part of the publication gives a multiple correlation analysis of the relation between milk production and the 9 factors listed below. The index of multiple correlation, curvilinear analysis, was found to be 0.860 ± 0.038 for the route records and 0.545 ± 0.135 for the survey records. The coefficients of determination for the route records were total digestible nutrients except pasture 15.2, nutritive ratio 23.4, per cent of protein "good" —3.9, per cent of lime —0.7, per cent of summer feeding 7, per cent of nutrients fed as silage 2.6, fat test of milk 18.6, per cent of herd fall-freshening 8.2, and value per cow 3.6. The effects of the several factors on milk production are discussed. Comparisons are made with the results of other studies.

In the second part of the study application of different sets of prices is made to the results obtained in part 1 to illustrate how the most economical practice would change with changing conditions, as price of feeds, quality of milk in demand, methods of paying for milk, etc.

The study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the State Department of Markets.

The peach industry in New Jersey, A. G. WALLER and H. B. WEISS (*New Jersey Stat. Bul. 452 (1927)*, pp. 39, figs. 4).—This bulletin, prepared in cooperation with the New Jersey State Department of Agriculture, gives the results of a statistical and economic study of the peach industry in New Jersey. Tables and charts are given and discussed covering for New Jersey and competing States the production of peaches, yields per acre, number of bearing and nonbearing trees, ages and varieties of trees, approximate ripening dates, carload shipments by years, months, and weeks, distribution of shipments, cost of developing one acre of peach orchard and cost of production per bushel after development, and freight rates to leading cities.

The potato industry in New Jersey, W. H. MARTIN, A. G. WALLER, and H. B. WEISS (*New Jersey Stat. Bul. 454 (1927)*, pp. 31, figs. 2).—This bulletin includes information regarding the acreage, production, and yields of potatoes, 1910–1926, and the shipments by months, 1922–1926, for New Jersey and competing States; and the changes in the potato industry; the organization, returns, etc., on potato farms, 1914 and 1924; cultural practices; marketing; prices; etc., in New Jersey.

The poultry situation in Idaho, R. T. PARKHURST and G. L. SULERUD (*Idaho Sta. Bul. 154 (1927)*, pp. 47, figs. 15).—This is part 4 of a tentative report of the agricultural situation in Idaho, previously noted (E. S. R., 58, p. 80). The status, importance, and production trends of the poultry industry in the United States, Idaho, and the different sections of Idaho are described. The factors encouraging the growth and development of the industry in Idaho, the marketing of the poultry products of the State, and the outlook for the industry in the several districts of the State are discussed. Numerous tables, graphs, and maps are included.

Retail margins in marketing home-grown fruits and vegetables in St. Paul, 1925, W. C. WATTE and H. B. ROWE (*Minnesota Sta. Bul. 236 (1927)*,

pp. 30, figs. 9).—This bulletin reports the results of a study based upon data obtained for the period June 9 to September 19 from 12 stores located in different parts of the city and catering to different classes of trade. Gross margins are considered to be the difference between the price at which retailers actually bought and the price at which they sold commodities. The prices of 18 fruits and vegetables are used.

The average margin for the different stores varied from 29.9 to 44.5 per cent. The average margins on different commodities varied from 19.7 per cent for strawberries to 55.2 per cent for leaf lettuce. The expected margins on commodities with retail units of different prices were computed. These were found to be 1.42 cts. for commodities having a retail unit selling at 2 cts. and to increase about 2.9 cts. for each additional 10 cts. in the selling price per retail unit. The percentage of margin for retail units selling from 8 to 25 cts. decreased from 39.4 to 32.3. For retail units selling below 8 cts., the percentage increased rapidly to 71. The actual margins taken on corn, cauliflower, squash, rhubarb, celery, tomatoes, spinach, and wax beans were from 0.3 to 13.9 per cent greater, and those on lettuce, peas, carrots, beets, radishes, cabbage, onions, raspberries, asparagus, and strawberries from 2.7 to 13 per cent less than the computed expected margins on the several commodities. The volume in which commodities were handled and the losses from waste were the chief causes of the discrepancies between the actual and the computed margins.

Charts and tables are included showing the seasonal variations in the margins on different commodities, the average margin on each commodity in each store, and the range in margins on each commodity. Comparison is made of the results of this study with those of studies in other localities and for other commodities.

National standards for farm products, L. S. TENNY (*U. S. Dept. Agr. Circ. 8* (1927), pp. 52, figs. 14).—Brief descriptions are given of the outstanding points in the development of Federal standards for cotton; dairy and poultry products; fruits, vegetables, and related products; grain; hay and related products; livestock and meats; tobacco; and wool. A list of standards for farm products formulated by the Bureau of Agricultural Economics is included.

Village communities, E. DES. BRUNNER (*New York: George H. Doran Co., 1927*, pp. IX+13-244).—This volume is the fifth and last of the series of the Institute of Social and Religious Research embodying the results of a national study of the agricultural village and its community in the United States. The results of the entire study, the data for which are included in volumes previously noted (*E. S. R.*, 58, p. 82), are summarized in part one in chapters on villages and villagers, village and country, the economic life of villages, education, health, the church in the village, and social life in villages.

Part two is devoted to individual studies of 8 of the 140 villages surveyed, the villages being described as an old eastern village, villages illustrative of the new and old in southern agriculture, a "poor-soil" town and a "tall-corn" community of the Corn Belt, a dairying center, a stronghold of cooperation representative of the Pacific Coast, and a village in one of the Colonial States showing the evolution of an American village.

Oklahoma: An index to the State official sources of agricultural statistics, including a list of the unofficial sources of Oklahoma agricultural statistics, compiled by I. E. WRIGHT (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 21* (1927), pp. IV+460).—This is the second of a series of bibliographies previously noted (*E. S. R.*, 55, p. 187) and was prepared in cooperation with the Oklahoma Agricultural Experiment Station. Publications on forests

and forest products, mortgage debt, cooperation, irrigation, and weather reports are included, besides those on crops, livestock and livestock products, farms and farm property, and population. A list of the unofficial sources of Oklahoma agricultural statistics, compiled by M. Walters, is included (pp. 447-453).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Extension service handbook on agriculture and home economics, compiled and edited by T. W. HARVEY (*U. S. Dept. Agr., Ext. Serv. Handb., 1926, pp. IV+953, figs. 14*).—This is a loose-leaf handbook, the primary purpose of which is "to place in the hands of extension workers the practical results of the research of the United States Department of Agriculture that are ready for extension, and to continue this service throughout the future." The material has been classified on a subject-matter basis into 29 divisions and a comprehensive classification scheme included for each division. The divisions with the pages at this time are as follows: General (pp. 1-33), extension (pp. 35-90), agricultural economics (pp. 91-221), agricultural engineering (pp. 223-276), agricultural technology (pp. 277-326), animal diseases, parasites, and other abnormal conditions (pp. 327-373), animal husbandry (pp. 375-443), dairying (pp. 445-483), entomology (pp. 485-537), fertilizers (pp. 539-559), field crops (pp. 561-643), forestry (pp. 645-677), horticulture (pp. 679-788), plant diseases (pp. 789-878), soils (pp. 879-902), weather (pp. 903-927), and wild life (pp. 929-953).

Agricultural economics in Europe, A. HOBSON (*Jour. Farm Econ., 9 (1927), No. 4, pp. 421-432*).—A brief description is given of the teaching, research, and extension work in agricultural economics in the several countries of Europe.

Outline for a general course in rural sociology, G. S. HUGHES (*New York: Inst. Social and Religious Research, 1927, pp. [2]+28*).—This outline is designed primarily for institutions able to offer only one course in rural sociology, and is based on the thesis that the agricultural village occupies a central place in the life of rural America. The course presented rests chiefly upon the American Village Studies of the Institute of Social and Religious Research, noted previously (*E. S. R., 58, p. 82*) and on page 385.

FOODS—HUMAN NUTRITION

A bibliography for cookery investigation problems, compiled by V. CARLSON (*New York: Bur. Pub., Teachers Col., Columbia Univ., 1927, pp. V+68*).—"This bibliography has been prepared as an aid to teachers and students of investigation cookery and cookery research. It is intended to provide a working background for those who wish to undertake new problems and also to furnish material to assist the student in her appreciation of independent, individual, productive work. Since there is nothing so effective in engendering the spirit of research as contact with the work of those who exemplify that spirit, several articles on the appreciation of research have been included."

[Food value of pasteurized milk] (*Illinois Sta. Rpt. 1927, p. 159*).—A comparison by J. M. Brannon and M. J. Prucha of the growth of two groups of 19 rats each, fed unpasteurized and pasteurized milk, respectively, both being supplemented after 1½ months by yeast tablets and a few drops of cod-liver oil about three times a week, showed no differences which might be attributed to the lowered food value of the pasteurized milk.

Economy of different cuts of pork determined (*Illinois Sta. Rpt. 1927, pp. 86-88, figs. 2*).—S. Bull and J. H. Longwell slaughtered 161 butcher hogs fed to weights of 225 lbs. each in the swine type experiments previously noted (*E. S.*

R., 56, p. 264). The amounts of lean meat in the various cuts were Boston 84, sausage 75, loin 66, ham 62, picnic 61, spareribs 60, belly 45, and neck bones 36 per cent, and fat back and clear plate none. The relative amounts of fat were fat back and clear plate 90, belly 50, sausage 25, ham 24, picnic 21, loin 15, and Boston 11 per cent, and spareribs and neck bones none; of skin, back fat and clear plate 10, belly 6, picnic 4, and ham 3 per cent, and other cuts none; of bones, neck bones 64, spareribs 41, loin 18, picnic 14, ham 10, and Boston 5 per cent, and other cuts none. Neck bones at 10 cts., sausage 25, spareribs 20, Boston 30, and picnic cuts 25 cts. per pound were considered much more economical than ham at 40 cts., loin 40, and belly 50 cts. per pound as sources of lean meat and of total edible meat.

Scales have been devised for calculating the cost per pound of lean meat and of total edible meat (lean and fat) in the different cuts at different prices.

Home cured pork, F. R. EDWARDS (*Georgia Sta. Circ.* 81 (1927), pp. 222-225, fig. 1).—Directions applicable to southern farm conditions are given for curing, by the dry and brine methods, and smoking soft pork produced from pigs fed on peanuts, chufas, and other southern feeds.

Bananas in the diet, W. H. EDDY (*Food Facts*, 3 (1927), No. 6, pp. 10-12, 31, figs. 4).—A popular article similar to one previously noted (E. S. R., 56, p. 894), but containing in addition the statement that bananas contain vitamin E.

Nutritive properties of the mung bean, V. G. HELLER (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 435-442).—In this investigation at the Oklahoma Experiment Station, young rats were fed ground mung beans to the extent of 60 per cent of a diet which included one or more of various constituents designed to supplement any possible deficiencies in the mung bean, with starch to complete the 100 per cent. The experiments were continued through growth, reproduction, and weaning of the young and sometimes into the third generation.

On 60 per cent of mung bean, 38 of starch, and 1 each of sodium chloride and calcium carbonate, growth was somewhat retarded, but there was reproduction and some of the young were weaned successfully. This ration supplemented by 3 per cent of cod-liver oil to furnish fat-soluble vitamins gave no better results, nor was there any improvement on substituting the McCollum salt mixture for the salt and calcium carbonate to make up for any deficiency in the mineral content of the beans or by adding an extract of wheat embryo to increase the content of vitamin B or by increasing the amount of the mung bean itself. Better reproduction records were secured with the addition of 1 per cent of cystine, although even with this addition growth was somewhat retarded. It was concluded, however, that the mung bean is superior to other beans in its protein and to cereals in its content of vitamin A.

It was also found that the utilization of the protein of the bean was slightly improved by autoclaving at 15 lbs. pressure for one hour, but was somewhat lowered by autoclaving for three hours. Analyses of two varieties of mung bean at different stages of maturity indicated that after growth and podding have taken place no important changes in composition occur. Since the beans do not ripen uniformly and some seeds shell off before others mature, it is suggested that the most economical method of handling would be to harvest the plant after the pods have filled out but before the beans begin to mature.

A study of the laxative action of wheat bran, G. A. WILLIAMS (*Amer. Jour. Physiol.*, 83 (1927), No. 1, pp. 1-14).—In an attempt to determine what constituents of bran are responsible for its well-known laxative effect, dogs were fed for 8 days on a standard diet in amounts sufficient for nitrogen equilibrium, and for another 8-day period on the same diet supplemented by a definite percentage of the material to be tested. The number of defecations and the total

weight of dried feces in each period were used as criteria of the laxative action of the added material.

Air-dried, washed bran in quantities ranging from 10 to 0.5 per cent by weight of the control ration had a laxative action varying with the amount fed, the minimum effective dose being about 2 per cent by weight of the food intake, or 200 to 275 mg. daily per kilogram of body weight. This was accomplished with a loss in water from the body amounting to 2 gm. for 10 per cent of the washed bran.

Paper pulp cellulose fed in amounts equivalent to the percentage of crude fiber in the washed bran was laxative, but not to the extent of the crude fiber of the bran itself. This proved laxative even when fed in the small quantities corresponding to the fiber content of 3 per cent of bran. While the bran itself was not feces-forming in the sense that it produced more than its own weight of feces, the crude fiber of the bran increased the weight of the feces by more than three times the weight of the fiber intake.

The normal diet, W. D. SANSUM (*St. Louis: C. V. Mosby Co., 1927, 2. ed., pp. 136, fig. 1*).—This is a considerably enlarged revision of the book previously noted (*E. S. R.*, 54, p. 889).

On the hydrogen ion determination of normal saliva, M. HENDERSON and J. A. P. MILLET (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 559–566, figs. 3).—H-ion concentration determinations by the colorimetric method of the saliva of normal individuals at frequent intervals throughout the day gave results ranging from pH 6 to 7.4. After meals the H-ion concentration tended to fall to a point slightly lower than just before meals, while between meals under normal conditions the reaction was practically neutral. Evidence was obtained that the rise in pH after meals may be due solely to mastication.

Observations on the nature of the sugar of normal urine, I. GREENWALD, J. GROSS, and G. MCGUIRE (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 491–508).—Continuing the investigation of the nature and origin of sugar in urine (*E. S. R.*, 53, p. 63), the authors have found that the sugar content of the urine may be increased by the ingestion of heated sugars, but that the increases observed after the ingestion of considerable quantities of such material are too small to warrant the suggestion previously made that carbohydrates altered in cooking make up a considerable part of the sugar of the urine.

Feeding experiments with glucose showed either no increases in the amount of sugar in the urine or no greater increase than those observed after a mixed meal. There was no evidence of a lowered tolerance of glucose taken with a protein-fat meal. Reducing substances other than glucose have been found in some urines, but the previous suggestion that this material may be pentose was not confirmed, since the material yielded phenylglucosazone instead of pentosazone. The possibility is suggested that the sugar is of bacterial origin.

A study of the effect of creatine on growth and its distribution in the tissues of normal rats, A. CHANUTIN (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 549–557).—In an effort to obtain information on the capacity of the tissues for creatine storage and the possible relationship of this substance to increases in body weight, three groups of young rats were fed an adequate diet in which for two groups 0.67 and 2.67 per cent, respectively, of creatine had been substituted for an equivalent amount of dextrin. At the end of one month half of the rats, and after two months the remainder, were killed and the tissues analyzed for creatine.

The average values for the creatine content of the tissues of the normal animals were muscle 0.449, testes 0.281, heart 0.174, brain 0.129, kidney 0.046, and liver 0.033 per cent. The feeding of creatine had no effect on the creatine content of the heart, brain, and testes, but there was a very slight increase in the

creatine content of the muscles, a still greater increase in that of the kidneys, and a marked increase in that of the liver. Growth was not affected.

It is suggested that the liver may play an important rôle in creatine metabolism quite independent of carbohydrate metabolism.

The availability of disulfide acids as supplementing agents in diets deficient in cystine, B. D. WESTERMAN and W. C. ROSE (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 533-541, figs. 4).—Following the successful attempt to replace histidine by the nonamino compound *dl*- β -4-imidazole lactic acid (E. S. R., 56, p. 86), the authors have attempted to find some sulfur compound of more or less similarity in structure to cystine capable of replacing cystine in the diet. Neither of the two compounds tested—synthetic dithiodiglycollic acid and β -dithiodipropionic acid—proved capable of supplementing cystine, and the former appeared to inhibit growth even in the presence of cystine. The presence of β -dithiodipropionic acid, on the other hand, did not interfere with growth provided sufficient cystine was present.

Zinc and normal nutrition, R. B. HUBBELL and L. B. MENDEL (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 567-586, figs. 2).—This investigation of the rôle of zinc in normal nutrition included determinations of the zinc content of some common foods, the effect of low and high zinc diets on the growth of mice, and the relation of the zinc content of the bodies of these mice to their diet.

In the zinc determinations both wet and dry methods of ashing were used, and for the actual estimation the usual titration with potassium ferrocyanide, with uranium acetate as outside indicator, and a similar titration but with potentiometric determinations of the end point. All of these methods are described in detail, and data are reported on the zinc content as thus determined of peas, carrots, beets, cabbage, milk, egg yolk, oysters, clams, and lettuce. Analyses were also made of the constituents of the basal diet employed in the feeding experiments. Of the foods tested, the zinc content varied from 5.1 mg. per kilogram in a sample of lettuce to 412.2 mg. in a sample of oysters.

The low zinc diet consisted of specially purified casein, starch, and lard, with a salt mixture, cod-liver oil concentrate, and yeast powder, the whole mixture furnishing 0.005 mg. of zinc per mouse per day. Three other diets were used, a standard complete diet for mice and the low zinc diet containing in addition zinc sulfate in amounts sufficient to bring the zinc content up to 0.02 and 0.04 mg., respectively, per mouse per day. The mice were kept in cages prepared from ordinary glass and porcelain ware.

A comparison of the growth of groups of from 8 to 15 mice, males and females separately, for periods of 20, 45, and 70 days showed a retardation of growth on the low zinc diet and stimulation of growth as compared with the low zinc diet on the one containing 0.02 mg. of zinc, and irregular results, sometimes on the side of stimulation and sometimes of retardation, on the diet containing the large amount of zinc. The stimulating effect of the small amount of zinc was more marked with females than males, but the growth on this diet was not quite equal to that on the normal diet.

A preliminary survey of the zinc content of stock mice from 1 to 300 days old gave values ranging from 0.021 to 0.030 mg. per gram of mouse, the lowest figure being for the normal at birth and the highest for those in old age. Values at from 22 to 70 days of age showed little fluctuation, being slightly less than for old age. Of the experimental mice, those fed the low zinc diet had a decidedly lower content of zinc than the controls. The smaller increase in zinc brought up slightly the content of zinc in the bodies of the mice. With the larger amount there was an increase in the zinc content of the males but not the females. In both of these groups the zinc content was comparable with

that of the control animals and those on the stock diet, although the intake was much smaller.

"While there is some evidence from the work done that the addition of a small amount of zinc may cause a very slight stimulation in growth, it seems probable that the addition of zinc alone to a food mixture low in the metal is not sufficient to make the diet equal to standard. It is possible that any value which zinc may have lies not alone in the presence of the metal itself, but that it may be in some way associated in function with other metals present in small amounts. It is not unlikely, however, that there is some variation in growth with varying amounts of zinc, and that the metal is not merely an accidental factor in the nutrition of the mouse."

Reaction of fatty extracts of certain organs with the antimony trichloride test for "vitamin A" (preliminary note), W. H. WILSON (*Biochem. Jour.*, 21 (1927), No. 5, pp. 1054-1058).—Preliminary observations are reported on the relative vitamin A values of cold ether extracts of human and animal livers as determined by the antimony trichloride test of Carr and Price (*E. S. R.*, 56, p. 10). The standard unit of comparison was a sample of cod-liver oil which, when tested in 20 per cent solution, gave a color matched by a 1/5,000 solution of indigo carmine. In terms of this unit, the values of some of the liver extracts tested were guinea pig 3.5, ox 10 and 11, water buffalo 6, camel 12.5, and sheep 7.5 and 8. If the substance giving the reaction is identical with vitamin A, the values reported indicate that liver is considerably richer in vitamin A than cod-liver oil. From the average of the results reported for the ox, sheep, camel, and water buffalo, it has been calculated that 100 gm. of liver would have the same vitamin A value as 22.5 gm. of a good sample of cod-liver oil.

Experiments on nutrition.—VIII, Comparative vitamin B value of food-stuffs: Cereals, I, R. H. A. PLIMMER, J. L. ROSEDALE, W. H. RAYMOND, and J. LOWNDES (*Biochem. Jour.*, 21 (1927), No. 5, pp. 1141-1161).—This has been essentially noted from another source (*E. S. R.*, 55, p. 294). As determined by the authors' technique, which differs radically from that usually employed in vitamin B studies, the cereal grains wheat, rye, and barley are of about equal value as a source of vitamin B for pigeons. Compared with these, millet and dari have a slightly higher, corn a slightly lower, and oatmeal a decidedly lower value.

[The distribution of vitamin B in the rice kernel and in corn products] (*Illinois Sta. Rpt.* 1927, pp. 263, 264).—A study of the distribution of vitamin B in the various structural parts of the rice kernel has been made by H. M. Croll, following the technique employed by Croll and Mendel in a similar study of the corn kernel (*E. S. R.*, 54, p. 793). In the hand-dissected grains the embryo end seemed to be richer in vitamin B than the endosperm end, although not all of the vitamin was located in the embryo. It is suggested that the presence of vitamin B in the endosperm end of the rice kernel may be due to its presence in the bran, which is retained in unpolished rice, rather than its presence in the endosperm itself.

The results obtained in an examination for vitamin B of a large number of corn products used as animal feeds and for human food are summarized as follows: "Whole corn, corn germs, and those corn products which include corn germs, such as corn germ meal, gluten feed, hominy feed, and whole ground corn meal retaining germs, contain considerable amounts of vitamin B. On the other hand, corn products consisting largely of corn endosperm or hulls, and containing little or no germs, such as hominy in its various forms, the various grades of corn meal not containing germs, corn flour, crude and refined corn oils, cornstarch, grits, gluten, hulls, 'steep water,' and corn flakes seem to be

relatively poor sources of this vitamin. The amounts present depend largely on the amounts of the germ left in the milling process. There may be some destruction of vitamin B in pop corn as a result of heating."

Some effects upon the young of inadequate maternal diets.—I, Polyneuritis and hemorrhages, C. U. MOORE, J. L. BRODIE, and R. B. HOPE (*Amer. Jour. Physiol.*, 82 (1927), No. 2, pp. 350-357, figs. 6).—In this investigation special attention was paid to the clinical symptoms and pathological changes in young rats suffering from polyneuritis before weaning because of deficiency in the mother's diet. The diet producing this condition consisted of casein 18, Crisco 3, cod-liver oil 2, salt mixture (McCollum 185) 4, dextrin 71, and yeast foam tablets 2 per cent. This proved satisfactory for growth from weaning to sexual maturity, but 72.9 per cent of the young in the 40 litters included in the present study died before weaning. The chief clinical signs occurring during the first week, when 45 per cent of the young died, were subcutaneous hemorrhages around the snout, the feet, and the glandular adipose tissue between the shoulders. The animals dying during this time showed on autopsy visceral and intracranial hemorrhages. The stomachs were full of curdled milk, thus indicating no deficiency in the quantity of the milk received.

The young surviving the first week but dying in the third grew at a nearly normal rate for about two weeks, but showed paralytic or convulsive symptoms or a marked fall in body temperature and general prostration. All had profuse watery stools and hemorrhages. That the hemorrhagic condition was not scorbutic was shown by the fact that the inclusion of 12 per cent of lemon juice in the drinking water was of no benefit.

To determine whether the deficiency was prenatal or postnatal, two litters were interchanged, half of the young of a mother on the deficient diet being given to one on a complete diet and vice versa. All of the young nursed by the rat on the deficient diet died and all of the others survived, showing that the trouble was chiefly postnatal. The young which survived long enough to begin to eat some of the experimental diet recovered completely, and an increase of yeast in the mother's diet of from 2 to 7 per cent decreased the mortality in the young to about 9 per cent, practically eliminated the paralysis, and greatly lessened the hemorrhagic condition.

The calcifying potency of codliver oil, J. O. ELY, H. E. HONEYWELL, and R. A. DUTCHER (*Pennsylvania Sta. Bul.* 213 (1927), p. 4).—The authors have found it impossible to bring about normal calcification of the bones of rats on the Steenbock yellow corn rachitic ration supplemented with cod-liver oil. Small additions of the oil prevent the development of rickets, but the maximum rate of calcification is always below normal. Determinations of bone ash are considered more capable of quantitative interpretation than the line test.

Bone calcification in rats as influenced by ultra-violet light from various sources, H. E. HONEYWELL and R. A. DUTCHER (*Pennsylvania Sta. Bul.* 213 (1927), p. 5).—A comparison of the amounts of calcium deposited in the skeletons of rats irradiated with a quartz mercury vapor lamp and the carbon arc lamp with blue flame electrodes indicates that the former source of ultra-violet light is slightly superior to the latter. It is considered better to irradiate the ration than the animals. A 5-minute period daily has been found to bring about practically the same calcification as a 15-minute period and to be less harmful.

The antiscorbutic fraction of lemon juice, VI, E. HOYLE and S. S. ZILVA (*Biochem. Jour.*, 21 (1927), No. 5, pp. 1121-1127).—In this continuation of the investigation of the chemical nature of vitamin C (E. S. R., 57, p. 790), the examination of the active fraction from lemon juice for the presence of inor-

ganic constituents (E. S. R., 56, p. 311) has been extended to manganese, iron, and sulfur and a further study has been made of the phosphorous content. With the use of reagents containing none of these elements traces of iron, phosphorus, and sulfur were found in the active concentrate, but manganese was not present. The figures for total phosphorus were slightly lower than those reported previously.

Growth and reproduction on synthetic diets, II, G. A. HARTWELL (*Biochem. Jour.*, 21 (1927), No. 5, pp. 1076-1086, figs. 3).—Continuing her efforts to obtain a satisfactory synthetic diet for use in nutrition experiments on rats (E. S. R., 56, p. 693), the author has made several adjustments in the diet previously found to be most satisfactory which have given considerable improvement in reproduction and lactation. The various diets tested are recorded, with comments on their success and failure.

Energy transformations in the human body, H. B. THOMPSON (*Food Facts*, 3 (1927), No. 6, pp. 7-9, 20-22, figs. 4).—Of particular interest in this general discussion of the energy requirements of the body under various conditions is the historical treatment of the development of various forms of calorimeters for measuring energy transformations.

TEXTILES AND CLOTHING

First annual report of the president, the Cotton-Textile Institute, Inc., W. D. HINES (*Cotton-Textile Inst. Ann. Rpt. Pres.*, 1 [1926-27], pp. [2]+33).—This is a review of the activities of the organization during its first year.

The British Research Association for the Woollen and Worsted Industries, S. G. BARKER and A. FROBISHER (*Brit. Research Assoc. Woollen and Worsted Indus. Pub.* 78 (1927), pp. [1]+47, pls. 5).—This publication outlines the activities of the association, and summarizes the results of research under its auspices concerned with raw wool, chemical and physical aspects of wool, fastness of dyes, action of bacteria on wool, and woollen carding and spinning.

Experimental yarn sizing plant and some results obtained with it, G. F. NEW (*Jour. Textile Inst.*, 18 (1927), No. 9, pp. T303-T310, pl. 1, figs. 3).—A water-jacketed boiler and a small scale sizing machine specially designed for the preparation of sizes and their application to flax yarns are described in this contribution from the Linen Industry Research Association.

Experiments showed that above a certain temperature limit, which varies for different starches and is usually well below 100° C., no great difference is found in the character of the size produced by cooking at various temperatures. The duration of the cooking treatment appeared to have but little effect over the range from $\frac{1}{4}$ hour to 6 hours. In most of the tests described a standard time of 1 hour and a standard temperature of 100° were used. The protective power of the resulting size was found in most cases to be proportional to the concentration of the starch. Admixture of various oils and fats with the size seemed to produce a deterioration in the protective power when applied to the yarn, whereas the admixture of glycerine enhanced the protective power. When the oils and fats were applied to the surface of yarn which had been sized and dried a marked improvement occurred in every case. Of the materials examined paraffin wax and stearine appeared to be the most powerful.

Standard raw silk tests, D. E. DOURY (*Textile World*, 72 (1927), No. 18, pp. 93, 97, 101).—A discussion of the application of the methods of the American Society for Testing Materials to raw silk standardization.

Investigation of the rusty-brown discoloration of silk-fibres caused by microorganisms, Y. YENDO (*Bul. Uyeda Silk Tech. Col.*, 1 (1926), pp. 81, pls.

13, figs. 2; abs. in *Japan. Jour. Bot.*, 3 (1927), No. 3, p. (74)).—Cocoons, raw silk, frisons, and other waste silks often have a conspicuous discoloration if the processes of treatment or storage have not been properly conducted. Experiments by the author showed that in every case certain species of bacteria and fungi have been isolated from the discolored silk fibers. Bacteria causing the brown discoloration of silk fibers include one belonging to the *Bacillus subtilis* group and another to the *B. mesentericus* group. While both are common and widely distributed, their main source is the straw in which the cocoons are spun. The bacteria from the straw first infect the cocoons and cause their discoloration through rapid reproduction in the moist, warm atmosphere. By producing heat-resisting spores these bacteria survive the high temperatures during the stifling, drying, cooking, and reeling of the cocoons and continue to thrive on raw silks, boiled cocoons left after reeling, and frisons, causing the brown discoloration. *Aspergillus glaucus*, *A. glaucus* α , *A. glaucus* β , *A. fumigatus*, *A. albus*, *Penicillium commune*, and *P. brevicaulis* have been detected as the chief species of cocoon fungi, and they also attack frisons and other waste silks, causing the brown discoloration. Silk fibers attacked by microorganisms turn brown and become weaker because of decomposition. The brown discoloration is probably due to the production of a brown pigment, melanin, through the oxidation of tyrosin by tyrosinase. This is derived from the decomposition of the protein substances, particularly the sericin of the silk, through the proteolytic action of an enzyme secreted from the microorganisms.

Report of the sub-committee on light fastness.—I, **Light exposures, series 3**, W. H. CADY and W. D. APPEL (*Amer. Dyestuff Rptr.*, 16 (1927), No. 19, pp. 707-715).—According to a report made to the American Association of Textile Chemists and Colorists, 29 identical sets of 20 selected dyeings on half-blood worsted, plain weave cotton, and "Cinderella" silk cloth were exposed to daylight under varied conditions and in different localities at different times of the year repeatedly to violet carbon arc light and under controlled conditions of atmospheric humidity to incandescent lamp light. The exposures were so timed as to obtain the same average fading in each set, and the energy received by some of the samples was recorded with the aid of a barium photoelectric cell and automatic recorder.

The evidence obtained indicated that the relative fading in a series of dyeings exposed to daylight is decidedly influenced by the type of exposure, whether to direct sunlight, north sky, or cloudy sky light, and whether the exposure is continuous day and night in all weathers or only when the sun is shining. Approximately reproducible relative fading in a series of dyeings exposed to daylight can be obtained at widely separated stations in the United States when samples are exposed at an angle of 45° from the horizontal facing south, between 9 a. m. and 3 p. m. on sunny days only, in a cabinet covered with a good grade of window glass about $\frac{1}{8}$ in. thick and open at the sides to allow free access of air to the samples. The distance between the samples and the glass should be not less than 0.5 in. This test is currently recommended as standard for a daylight-exposure test.

No artificial light source is recommended at this time as standard for light exposure tests. The violet carbon arc is convenient and is doubtless the best available for quick tests, whereas the incandescent lamp does not seem practicable. The quantity of radiant energy falling on dyeings during exposure, as recorded by a photoelectric cell, does not correspond to the amount of fading produced. The fading of dyeings by light appear to be materially influenced by the conditions of exposure, such as the humidity of the air about the samples, and the amount of the influence varies among the individual

dyeings. A control of atmospheric conditions about the samples is deemed essential for a standard laboratory test.

The above observations may be amplified by more extensive studies in progress.

Report on experiments with the photoelectric cell in relation to testing fastness to light of dyed materials, W. D. APPEL (*Amer. Dyestuff Rptr.*, 16 (1927), No. 19, pp. 715-719, figs. 2).—Experiments at the U. S. Bureau of Standards involving the dyeings noted above gave indications that the amount of fading of dyed textiles under variable conditions of daylight exposure is not adequately measured by the incident energy recorded by the barium photoelectric cell.

Estimation of the fading power of sunlight throughout the year, S. G. BARKER, H. R. HIRST, and G. C. WARDLE (*Jour. Soc. Dyers and Colourists*, 43 (1927), No. 10, pp. 324-327, figs. 2).—The table presented permitted the construction of approximate tables of the value of the light in terms of June midday full sun for any period for any day during the year, given the month and time of observation. It was possible to obtain an approximate estimation of the amount of fading under standard time and light conditions for any dyestuff exposed to sunlight.

Testing methods, standards, and types for determining the fastness properties of dyeings on cotton, wool, and silk, I-III (*Amer. Dyestuff Rptr.*, 16 (1927), No. 17, pp. 611-615; *Amer. Dyestuff Rptr.*, Sample Swatch Quart., 1927, Oct., pp. 641-645; *Amer. Dyestuff Rptr.*, 16 (1927), No. 18, pp. 673-676).—This is the third edition of the report of the Fastness Commission of the section for chemistry of the dyestuffs and textile industries of the German Chemical Society.

Practical laboratory methods, R. H. SOUTHERN (*Amer. Dyestuff Rptr.*, 16 (1927), No. 20, pp. 747-750).—In a discussion of the advantages and uses of the small dyehouse laboratory, the author lists the most essential and least expensive equipment deemed necessary for practical and rapid methods of testing the more common textile materials and dyestuffs.

Processes and chemicals used to render fabrics water-repellent and waterproof, H. E. WENNSTROM (*Textile World*, 72 (1927), No. 16, pp. 47-49).—Several methods are outlined for rendering fabrics water-repellent or waterproof.

Asbestos textiles and their use, J. W. WEAVER (*Textile World*, 72 (1927), No. 18, pp. 101, 105).—The several types of asbestos textiles are described, together with reasons for their use.

On the properties of the new acetate silk (celanese, milanese, aceta, etc.), A. HERZOG (*Kunstseide*, 9 (1927), Nos. 1, pp. 7-11, figs. 5; 2, pp. 73-79, figs. 8).—Extensive studies on samples of cellulose acetate rayon from Germany, England, Belgium, and Switzerland, reported in both German and English, showed the average width of the dry spun fiber to range between 26.4 and 40.3 μ and of the wet spun fiber between 17.1 and 23.9 μ . The several sources had rather characteristic cross sections. The dry spun samples varied between 3 and 5 deniers in fineness, and the specific weight averaged 1.33 gm. The electrical conductivity of this fiber was found to be very slight.

Acetone dissolved cellulose acetate rayon, whereas chloroform caused it to swell, although other rayons are said to be not affected by these reagents. Water caused only a slight swelling. Cellulose acetate rayon melted at from 200° to 300° C. into an amorphous mass which became brown on further heating.

The average refraction of light by cellulose acetate rayon was 1.478, the lowest of rayons and other textile fibers, and this rayon was double refractory. Other behavior in relation to light is also described.

A. S. T. M. specifications and methods of test for textile materials, 1927 (*Philadelphia: Amer. Soc. Testing Materials, 1927, pp. 107, figs. 33*).—The methods of testing, definitions, of terms, and specifications for textile materials developed by the American Society for Testing Materials are outlined, with other data relating thereto.

Clothing construction, C. M. BROWN (*Boston and London: Ginn & Co., 1927, pp. XIV+236, figs. 189*).—This reference book on the principles of clothing construction and repair is based upon the composite experience of the author and five collaborators, all from the home economics department of the University of Minnesota. The subject matter is arranged alphabetically in terms of fundamental processes rather than of directions for constructing different garments. Illustrations, chiefly diagrammatic drawings, are included for nearly all of the processes described.

Children's rompers, M. A. DAVIS (*U. S. Dept. Agr. Leaflet 11 (1927), pp. 8, figs. 12*).—This leaflet describes, with photographic illustrations, various types of rompers for boys and girls up to six or eight years of age. Of particular interest is the sleeveless sun romper with semitransparent top of lawn, voile, or bobbinet.

HOME MANAGEMENT AND EQUIPMENT

[**Home planning investigations at the Arkansas Station**] (*Arkansas Sta. Bul. 221 (1927), pp. 9-11, figs. 4*).—A survey of 515 farm homes was made to determine the existing conditions, such as location and plan of house, sanitation, equipment, conveniences, and recreational facilities. Some of the data obtained regarding equipment, conveniences, sanitation, and recreational facilities are briefly summarized.

The Nebraska rural kitchen, G. GRAY (*Jour. Home Econ., 19 (1927), No. 9, pp. 504-512*).—The results are given of an analysis of 371 kitchen scores made by Nebraska women of their own kitchens in the home management extension classes in 1925. The score card used is included.

Electrical cooking appliances for domestic purposes, I, II, S. P. SMITH, N. M. MACELWEE, and J. G. BOYNE (*World Power, 6 (1926), Nos. 33, pp. 137-142; 34, pp. 197-204, figs. 6*).—In the first part of this paper types of electrical cooking apparatus available for domestic purposes are discussed, with special reference to electric boiling plates and their testing. In the second part specific tests with boiling plates are described. Apparently the more important feature of these tests is the method of testing used, which indicates that the data from such tests represent actual conditions and apply to these conditions only, thus inferring that in efficiency tests of this nature it is difficult to lay down general basic principles.

MISCELLANEOUS

List of bulletins of the agricultural experiment stations for the calendar years 1925 and 1926, C. E. PENNINGTON (*U. S. Dept. Agr. Bul. 1199 (1927), Sup. 3, pp. 62*).—This supplements the list previously noted (*E. S. R., 55, p. 898*).

Publications available for free distribution (*Idaho Sta. Circ. 49 (1927), pp. 4*).—The available station and extension publications are listed.

Thirty-ninth Annual Report [of Arkansas Station], 1927, D. T. GRAY (*Arkansas Sta. Bul. 221 (1927), pp. 66, figs. 18*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

A year's progress in solving some farm problems in Illinois: [Fortieth Annual Report of Illinois Station, 1927], compiled and edited by F. J. KEILHOLZ (*Illinois Sta. Rpt. 1927*, pp. 288, figs. 53).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and a summary of the work during the year. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of the Kentucky Agricultural Experiment Station for the year 1925, Part II (*Kentucky Sta. Rpt. 1925, pt. 2*, pp. [2]+323+34+[2], figs. 30).—This contains reprints of Bulletins 257-263 and of Circular 35, all of which have been previously noted.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 335 (1926)*, pp. 283-297+XIII).—This contains the organization list of the station; abstracts of 7 papers, 2 of which were previously noted and another abstracted elsewhere in this issue; meteorological observations, noted on page 312; a financial statement for the fiscal year ended June 30, 1926; an index to Bulletins 329-335, inclusive, which collectively constitute the forty-second annual report of the station; and announcements as to the work and publications of the station.

Fortieth Annual Report of the Pennsylvania Agricultural Experiment Station, [1927], [R. L. WATTS] (*Pennsylvania Sta. Bul. 213 (1927)*, pp. 42, figs. 14).—This bulletin discusses briefly the work of the station for the year ended June 30, 1927, including a financial statement for this period. The experimental work recorded and not previously noted is for the most part abstracted elsewhere in this issue.

Work of the United States Dry-Land Field Station, Ardmore, S. Dak., 1912 to 1925, J. S. COLE, F. L. KELSO, E. Z. RUSSELL, J. B. SHEPHERD, D. STUART, and R. R. GRAVES (*U. S. Dept. Agr., Tech. Bul. 17 (1927)*, pp. 68, figs. 17).—The experimental work recorded is for the most part abstracted elsewhere in this issue.

NOTES

Alabama Polytechnic Institute.—The resignation of President Spright Dowell, who has been appointed president of Mercer University, has been accepted to take effect June 1.

Georgia Station.—Henry K. Brabham has been appointed assistant agronomist, beginning January 1.

Idaho University and Station.—Dr. Frederick J. Kelly, dean of administration at the University of Minnesota, has accepted an appointment as president vice Dr. A. H. Upham. C. E. Lampman, assistant poultry husbandman at the Wisconsin Station, has been appointed head of the poultry department.

Cornell University.—A tract of 500 acres of abandoned farm lands near Newfield, about 15 miles from the university campus, has been given by an anonymous donor for use by the department of forestry in experiments and instruction and as an observation ground for botanists. The tract comprises five parcels, some barren, others submarginal land that will be reforested, and a portion now carrying stands of young timber which will be thinned for development into useful material.

Steps have been begun to develop the Arnot Forest of 1,850 acres given the university last spring, and located about 20 miles from the campus between Ithaca and Elmira. This tract presents a wide variety of forestry problems. Surveys are being made and roads reopened, and experiments are under way with various thinning and improvement cuttings and with chemicals to poison trees.

Dr. Lars G. Romell of the Swedish Forest Experiment Station at Stockholm has been appointed to the Charles Lathrop Pack research professorship in forest soils, beginning April 1. It is hoped that the investigations to be undertaken will coordinate studies in several fields of science, especially the chemistry and biology of soils and the study of heredity in tree growth, particularly as this may help to solve problems of adapting species to given soils.

Dr. Otto Rahn, head of the department of dairy physics at the agricultural experiment station at Kiel, Germany, has been appointed professor of bacteriology in the department of dairy industry.

Oklahoma College and Station.—Effective January 1, James F. Page has been appointed associate professor of rural sociology and in charge of research and teaching vice L. D. Howell, resigned to accept a position as head of the agricultural economics department of the West Texas Technological Institute.

Rhode Island Station.—Dr. John L. Tennant of Cornell University has been appointed associate agricultural economist.

Texas College.—O. B. Martin, in charge of extension work for the Southern States in the U. S. D. A. Office of Cooperative Extension Work and associated with the extension movement since 1907, has been appointed director of extension work, beginning February 1.

West Virginia University.—Dean John Roscoe Turner of New York University has been appointed president vice Dr. F. B. Trotter, who is to retire in July.

Wisconsin University.—The College of Agriculture has been authorized by the board of regents to prepare definite plans for cooperative forestry research. In this work the resources of the college and the State conservation commission will be united with those of the U. S. D. A. Forest Service. At the outset no specific physical plant will be developed, but several pieces of research will be formulated and arrangements made for staff appointments and assignments that will undertake the study of the problems wherever they can best be carried out. These studies will embrace the treatment and handling of the farmer's wood lot as well as the better management of commercial forest tracts.

Allegheny Forest Experiment Station.—The headquarters for this station (E. S. R., 57, p. 800) have now been selected in Philadelphia. The station is to cooperate with the University of Pennsylvania, which is providing office facilities. Dr. Arthur P. Kelley, assistant professor of botany in Rutgers University, has accepted an appointment as associate forest ecologist.

Tea Research Institute of Ceylon.—This institute began operations in March, 1927. In addition to a director, the staff includes an entomologist, a mycologist, and a biochemist, and it is planned to add an agricultural chemist. Some difficulty has been experienced in obtaining a suitable site, and temporary quarters are being utilized. Special attention is being given to a study of the physiological processes of the tea plant.

Sakrand Agricultural Research Station, Sind.—This station has been established to deal with the many problems resulting from the adoption of the Sukkur Barrage Scheme and the large increase in the irrigated area in Sind. A tract of 234 acres of representative land was cleared in 1925 and an irrigation supply obtained and crops grown in 1926-27. The purpose is to determine the crop rotations which can best be grown under the conditions and the effect on the development of injurious salts.

American Society of Animal Production.—The annual meeting of this society, held at Chicago on November 25 and 26, 1927, brought together an attendance larger than for any preceding meeting. Nearly 200 members were present at certain of the sessions, representing agricultural colleges and experiment stations in over 30 of the States, Canada, and South Africa, the U. S. Department of Agriculture, commercial organizations, and others.

The address of President E. S. Good referred to the extensive organization which has been developed in the United States for experimental, teaching, and extension purposes, in which animal husbandry holds an important place. Deploring the early instruction in agriculture as very elementary and limited, he showed that as science was fostered by the Hatch, Adams, and Purnell Acts for research at the State experiment stations much advance followed. This advance involved changes in the methods and the preparation for different types of college, station, and extension activities, and has resulted in a necessity for a broader background and greater specialization.

Dr. E. B. Forbes discussed the Utilization of Food as Affected by the Plane of Intake on the basis of experiments conducted at the Pennsylvania Institute of Animal Nutrition, bringing out the fact that the net energy values of certain rations were lowered as the plane of intake was raised. Other papers, dealing with the protein and mineral metabolism of animals, were presented as follows: Calcium Phosphorus Relationship in Animal Nutrition, by R. M. Bethke; Results of Wide, Medium, and Narrow Nutritive Ratios for Fattening Pigs, by J. M. Fargo; Results of Feeding Copperas in Paired Feeding Experiments, by W. E. Carroll and H. H. Mitchell; Maintenance Requirements of Range Cattle, by E. L. Potter; and Influence of Atmospheric Temperature on Production in Dairy Cattle, by E. Weaver. Considerable interest was shown in a paper by

L. A. Maynard and R. C. Bender, entitled *Accumulative Effect of a High Protein Diet upon Reproduction and Lactation*. In experiments with rats it was found that very high protein rations resulted in some degeneration in the kidneys, but this did not appear to interfere with reproduction, as large and frequent litters were produced by females on such diets.

The society was divided into three luncheon sessions on the opening day. At the general session several papers dealt with feeding problems, as follows: *Color of Grass Fat Beef*, by C. W. McCampbell and D. L. Mackintosh; *Developing Range Cattle*, by H. J. Gramlich; *Six Years of Beef Cow Feeding in North Montana*, by L. Vinke; *Cottonseed Meal as Sole Concentrate for Fattening Yearling Cattle*, by W. L. Blizzard; *Soybeans Hogged Down in Green vs. Mature Stage*, by E. G. Godbey; *Forage Crops for Hogs*, by L. A. Weaver; *Soft Pork in the Southeast*, by F. R. Edwards; *Effect of Fineness of Division of Ground Limestone on Rations for Pigs*, by G. Bohstedt, and *Effect of Feeding Cottonseed Meal on Reproduction in Cows*, by R. S. Curtis. Other topics were *Special Ink for Tattooing Pigs*, by T. H. Hopper; *Accurate Methods of Selecting Wool Samples for Scouring*, by J. M. Jones; and *Correlation Studies in Wool*, by A. E. Darlow and W. A. Craft. Two papers were presented at the genetics luncheon session, *Inheritance of Persistency of Lactation*, by W. L. Gaines, and *A Theory of the Mode of Inheritance of Fat Secretion*, by C. W. Turner. R. A. Clemen presented a paper entitled *Changing Economic Conditions and Animal Type* at the extension luncheon session, which was followed by a round-table discussion of project work.

The afternoon program was divided into extension and genetics sessions. Two papers were presented at the former session, *The Relationship of the Extension Specialist and the Livestock Farmer*, by C. E. Snyder, and *The Relationship Between the Experiment Station and the Extension Specialist*, by R. K. Bliss. The papers presented at the genetics session dealt with crossbreeding problems and the inheritance of pathological conditions and disease resistance. J. L. Lush outlined the Practices and Problems Involved in Crossbreeding Cattle in the Coastal Plain of Texas, discussing primarily the crossbreeding work between native and Brahman cattle in this region. J. G. Fuller described the steers produced in the crossbreeding experiments between Holstein and Aberdeen-Angus cattle at the Wisconsin Station, pointing out that the crossbred steers were superior in most respects to the Holstein steers and in many respects equal to the Angus steers. E. N. Wentworth discussed The Packer's Interest in Crossbreeding, pointing out that the packer is mainly concerned with the cutting and killing qualities of the animals and the demands of the consumer. W. A. Craft spoke on Variations among Inbred and Outbred Litters of Swine, describing the progress which has been made in inbreeding and outbreeding by mating half brothers and half sisters at the Oklahoma Station. The progress in genetic studies of disease resistance at the Illinois Station was briefly discussed by E. Roberts, particularly with reference to the inheritance of resistance to bacillary white diarrhea, and also calling attention to further possibilities in this field. M. Manresa presented very definite results from a carefully planned study of the Inheritance of Resistance to Contagious Abortion in Rabbits. F. B. Hadley spoke of the inheritance of epithelial defects in Holstein cattle, which was concluded to be due to a simple recessive factor.

At the annual banquet C. S. Plumb spoke on *Ramblings among British Herds and Flocks*, describing particularly the sheep and the high-quality lamb and mutton which were on the English market, as well as the extensive pastures of vetch, sainfoin, and grass, and roots (left in the ground for winter pasture, thus making very little supplemental feeding necessary). G. I. Christie told of the seriousness of the European corn borer situation and the efforts which are

being made to find suitable means of control and limitations on the spread of this pest by a study in Europe.

The morning session of the second day was mainly concerned with feeding problems. The following papers were presented: Correlations Between Daily Gains and Feed Requirements of Growing and Fattening Swine, by J. M. Evvard, M. G. Snell, C. C. Culbertson, and G. E. Snedecor; Oats in Varying Proportions in Rations for Growing Pigs, by M. A. McCarty; Some Factors Affecting the Killing Qualities of Hogs, by E. L. Scott; Influence of Feed and Method of Feeding on the Type of Hog and Quality of Market Carcass, by J. P. Sackville; Posterior Paralysis in Hogs, by C. W. McCampbell and C. E. Aubel; The Ups and Downs of Cattle Financing, by C. I. Bray; Value of Alfalfa Molasses Meal in Fattening Lambs, by A. D. Weber; Factors Related to Production by Range Ewes of the Fine Wool Type, by W. E. Joseph; A Method of Determining the Scoured Weights of Individual Fleeces of Wool, by J. F. Wilson; and Experiments with Mules Doing Heavy Work, by G. S. Templeton.

The animal husbandman selected by the society for honor at its final dinner was Gordon H. True. A review of his accomplishments in teaching and research work, and especially in his upbuilding of the animal husbandry department at the University of California, was given by J. F. Wilson, Professor True responding with a discussion of present-day problems in animal husbandry.

The stock-judging team from the Iowa State College, winner of the inter-collegiate judging contest at the 1927 International Livestock Exposition, was presented to the society by J. H. Shepperd, and the prizes for the Saddle and Sirloln essay contest, written on the subject Value of a Financial Record on the Live Stock Farm, were awarded by C. E. Snyder. The subject for next year's contest was announced as The Place of the Purebred in Commercial Live Stock Production.

For the ensuing year E. W. Sheets was elected president, H. J. Gramlich, vice president, and J. R. Wiley, of the Indiana Experiment Station, secretary-treasurer. E. T. Robbins and C. D. Lowe were elected chairman and secretary, respectively, of the extension section.

The 1927 meeting was very successful from the standpoint of the large and representative attendance and the interest in the papers presented. The policy of dividing the meetings into sections allowed somewhat more time for individual papers and gave more opportunity for discussion. Either a continuance of this method or a much more rigid selection of papers is probably a necessity. The papers, as a whole, were of high grade, but in a few cases it appeared that preliminary results might well have been held until later in view of the congestion of the program.

American Farm Economic Association.—The eighteenth annual meeting of this association was held at Washington, D. C., from December 28-30, 1927. The research aspects of the meeting are considered editorially in this issue. The extension phases of farm economics were discussed at a round table on types of economic material and methods of procedure in their utilization in the development of State or regional programs. Another round table was devoted to papers on and discussion of the subject of how the agricultural college student should be introduced to the study of agricultural economics, special consideration being given to the scope and content of the basic group of courses.

A resolution was adopted opposing the reclamation of additional lands through large-scale drainage and irrigation operations until the income of farmers is on a par with that in other industries. Officers were elected for the ensuing year as follows: President, L. C. Gray; vice president, M. R. Benedict; and secretary-treasurer, W. I. Myers of Cornell University.

EXPERIMENT STATION RECORD

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The recent death of Dr. Henry Clay White has ended a career identified for many years with agricultural education and research in the South and the land-grant college system of the Nation. Going to the University of Georgia as professor of chemistry in 1872, just after the Morrill funds had been transferred to that institution, Dr. White had continued in that capacity for more than 55 years, a period of continuous service which must necessarily have been very seldom exceeded. From 1890 to 1907 he was also president of the Georgia State College of Agriculture and Mechanic Arts, and in that capacity he became an active worker in the Association of American Agricultural Colleges and Experiment Stations. He was president of the latter body in 1897-98, a member of its executive committee during most of the following decade, and chairman of the committee from 1901 to 1907. While eminent as a chemist, teacher, and executive, a member of many scientific societies at home and abroad, and the recipient of numerous honors from educational institutions and scientific organizations, it is perhaps for his services to the land-grant college group that he will be most widely remembered.

Dr. White was born in Baltimore December 30, 1848, and following his graduation from the University of Virginia in 1870, served two years as a teacher of chemistry in a number of institutions in Maryland. His entire career was thus spent in an essentially southern environment, and he was early recognized as one especially well qualified to represent that section in national gatherings. Yet he was in no sense provincial in his outlook, and as a leader in the Association of American Agricultural Colleges and Experiment Stations he was an important influence in promoting the conception of the land-grant institutions as components of a great national system.

The breadth of his viewpoint was well illustrated by his address as president before the association in 1898, devoted, as he put it, to a discussion of the association itself and designed to "review its purposes, to make clear, if I may, the magnitude of its potentialities, and to point out, with your permission, certain lines of special en-

deavor in which it may appropriately engage." In this address he spoke in part as follows:

"It is quite clear to my mind that the benefactions which founded these institutions were not a gift of the Nation to the several States; they were a distribution among the States of a national trust. Several parts of a single whole, organized with oneness of purpose, charged with prosecution of a common work, it may reasonably be assumed that it was expected that they should be in close and constant contact with each other, that unity in general methods might insure unity in object sought to be attained. True to the traditions of our peculiar form of Government, no central authority was instituted to control or supervise the operations of the colleges in the several States. Of themselves and through their self-appointed representatives only can they reach agreement concerning uniformity in methods which shall serve their common purpose. This association is the body of such representatives, and our councils should be animated, it seems to me, by a sense of our responsibility, not only to the particular college or station which we represent, but to the great national institution of which the colleges and stations are but parts."

Dr. White went on to emphasize in this address the responsibility of the constituent institutions, urging first of all representation at each annual convention as an obligation requisite to "entire fulfillment of duty to State and Nation." Furthermore, he urged that in the meetings themselves "first and chief place should always be given to discussion of the pedagogic methods employed in the colleges and in the correlated work of the colleges and stations," rather than to presentations of subject-matter themes in specialized fields. "It is very proper and eminently desirable," he said, "that the several specialists in our schools and stations should take counsel of each other concerning special lines of scientific and other work in which they are particularly and individually interested, but I submit that such matters should be subsidiary to the main purpose of the association. If time can be found for them at the general meetings, economy and propriety would approve their introduction. If not, they can more profitably find place in other and independent associations of specialists."

The pertinency and value of Dr. White's suggestions as to the character of the program may be better appreciated when it is recalled that the form of the convention organization at the time of his address differed materially from that in recent years. At the 1898 meeting the sections were entitled college work, agriculture and chemistry, horticulture and botany, entomology, and mechanic arts, and a considerable share of the program was devoted to such topics as the relations of commercial fertilizers and clover to wheat grow-

ing in Ohio, testing cows as to milk and butter production, and relation of climate and rainfall to the prevalence of fungus diseases. While no action was taken immediately as a result of his plea, sentiment steadily developed, and a reorganization was effected in 1902 along the lines suggested. One result of this change was doubtless to hasten the formation and growth of the many more specialized organizations now rendering conspicuous service.

Another idea which was stressed in the address was the need of fostering sympathetic and cordial relations with other educational bodies. While Dr. White foresaw a great and distinctive opportunity before the land-grant colleges, he believed that we "should remember that we shall not be expected to do all the educational work of the Nation." This, he argued, demanded closer contacts than had been the custom, "that we may not seem to stand apart as a peculiar people, but secure general recognition of the universality in value of the results of our endeavors."

Dr. White's address was delivered at the close of the Spanish-American War, and this event presumably led him to point out that the "amount of money employed in building and equipping even a fourth-class vessel of the Navy or to keep in commission upon a war footing for a single year a single battleship of the first class, was rather more than the amount paid annually out of the Public Treasury for the maintenance of all our colleges and all our stations; and that the amount voted by the American Congress, without a dissenting voice and with the full and enthusiastic approval of the American people, to be expended within a few weeks' time merely to prepare the Nation for a prospective war to be waged for purely humanitarian sentiments, was approximately equal to that now set apart by existing laws for the maintenance of all our colleges throughout the period of half a century." He maintained that with proper appeal more liberal aid would be given by the Nation for "agencies which, in time of peace, contribute to its prosperity, its happiness, its righteousness, its fame," and that action should be inaugurated to obtain "more generous provision for the maintenance of these national institutions of learning which are related so closely to the welfare and the honor of the Nation."

In the ensuing decade several of these matters assumed more tangible form, and it became Dr. White's duty as chairman of the executive committee to represent the association in many important negotiations. The Adams Act, soon doubling the Federal appropriations for the experiment stations, was enacted in 1906, and the Nelson amendment enlarging to \$50,000 the Federal appropriation to each State for collegiate instruction was approved the following year. Designation of the land-grant colleges as depositories for all public documents was secured. Participation by the colleges and stations

as a group in the St. Louis Exposition of 1904 was arranged. Closer relations were established with the National Education Association, culminating in the formation in that association of a department of rural education. After an agitation of several years, considerable attention was given to the feasibility of founding a national university as a graduate institution and to securing, in cooperation with the National Association of State Universities, the retirement privileges for the land-grant colleges under the plan offered by the Carnegie Foundation for the Advancement of Teaching. While little direct progress was made in either of these two directions, there was doubtless a distinct gain in strengthening the solidarity of the land-grant college group and in bringing about an increasing recognition of their work by other institutions and organizations.

Still another matter of some delicacy was the securing of greater cooperation between the experiment stations and the Federal Department of Agriculture. The desire for a more definite understanding had been growing with rapid expansion of the Department's program for research in the various States, and in 1903 a series of conferences between representatives of the Department and the executive committee was productive of great and lasting benefit, reflecting much credit upon all parties concerned.

Although virtually all of Dr. White's productive life was spent in one of the two States in which there is no Federal experiment station at the agricultural college, he was much interested in the promotion of research and sympathetic with its purposes and aims. He was unusually well equipped by temperament and training to carry it on, and one of his notable achievements was his comprehensive contribution issued in 1874 entitled *Complete Chemistry of the Cotton Plant*. In 1895-96 he collaborated with the U. S. Department of Agriculture in its cotton investigations, and in 1903-1905 with the nutrition investigations of the Office of Experiment Stations, carrying on a useful series of dietary studies. He served as State chemist from 1880 to 1890, and was president of the Association of Official Agricultural Chemists in 1880-81.

The Georgia Experiment Station was originally located in Athens in 1888. Dr. White was immediately appointed chemist and was the author of an article appearing in *Bulletin 2, Ash Analyses of Native Woods*. Upon the removal of the station to Griffin in the following year he continued to act as chemist under a special contract of the station with the college, and in 1890 when this contract expired he was appointed chief chemist and vice director. This title he retained until 1913 when he relinquished the vice directorship. In the following year he brought out his final contribution, a bulletin entitled *The Feeding of Cotton*, and withdrew from all station activity. Seven years earlier he had retired as president of the college,

but, as already noted, despite his advancing years he remained in service as a teacher virtually until the end came. He died at his home in Athens on December 1, 1927, after a life not only full in years but of unique service and of much influence.

The recent appearance in *Soil Science* of a detailed summary of the scientific contributions to the First International Congress of Soil Science of 1927 brings to mind the distinct loss which this science has sustained since the holding of the congress in the death of two of its most eminent pioneer workers. One of these was Dr. Konstantin D. Glinka, an outstanding figure in the congress and president elect of the International Society of Soil Science and of the second congress, scheduled to be held under its auspices in Russia in 1930. Following a severe sickness which began immediately upon his return from the congress, Dr. Glinka died on November 2, 1927. Less than a fortnight later, on November 11, Dr. Milton Whitney, associated with the soils work of the U. S. Department of Agriculture since 1894 and honorary chairman of the American organizing committee of the congress, passed away at his home in Takoma Park, Md., after a lingering illness of many months' duration.

In the words of a recent tribute by Sir John Russell, "it is now universally recognized that the Russian pedologists have added much to the resources of soil science, and among the foremost of the pioneers Glinka's name will always be counted." Born in 1867 in Smolensk of an aristocratic family, he studied at the universities of St. Petersburg and Moscow, where he became one of the leading pupils of Dokuchaiev, "the father of soil science in Russia."

Dr. Glinka spent much of his life as a teacher, first, of minerology and geology at the Agricultural Institute of Novo Alexandria and from 1902 to 1912 of pedology at that institute, the University of St. Petersburg, and the Higher Institute for Women. In 1913 he undertook the organization of the new Agricultural Institute of Voronezh, and since 1922 he had served as lecturer of the Institute of Agriculture at Leningrad, an institution reconstituted under his direction by the merging of three schools for higher agricultural education.

A brilliant and inspiring teacher and an able executive, Dr. Glinka was preeminently an indefatigable investigator. In addition to his studies at the various institutions enumerated, he took an active part in the organization of the Dokuchaiev Soil Commission under the auspices of the Emigration or Settlement Board of Russia, which from 1908 to 1914 made extensive surveys in European Russia and Siberia, and during this period he carried on many of the soil surveys in person. This task was interrupted by the World War and the subsequent unsettled conditions, but on his return to Leningrad

he became a member of the Institute of Agriculture, and in this capacity had charge of its soil research in his closing years.

Dr. Glinka was essentially a field worker, with "an amazing capacity," as Sir John Russell puts it, "for seeing things in a soil section that ordinary workers miss." On the basis of his observations and other data, he elaborated the Russian conception of a close relation between soil characteristics and climatic influences and set forth a classification from this viewpoint of the soils of the world. While such a classification has by no means been found universally adequate, the recognition of the necessity in a scientific classification of soils of basing the categories on soil characteristics as contrasted with the former reliance on the purely geological basis marked an advance of great importance. Although Dr. Glinka's views were somewhat tardily comprehended by workers in other lands, mainly because of their appearance in Russian publications of relative inaccessibility, the value of his contribution in making the study of the soil an exact science is steadily becoming better understood and more widely appreciated.

The need of closer contacts and increased international cooperation among soil scientists was early visualized by Dr. Glinka, and he took an active part in the initial conferences and in the organization of the International Society of Soil Science in 1894. He was conspicuous in the Washington congress, and it was in no small degree due to his efforts that Russia was selected as the 1930 meeting place. According to present indications this decision will not be altered because of his death, and the congress will be held as projected. None the less, he will be greatly missed in its councils, not merely as an organizer and presiding officer but as one of the great pioneers of the world in his chosen field.

Even more of the pioneer, deeply imbued with the spirit that dares and delights in exploring the regions of the unknown, was Dr. Milton Whitney. As Sir John Russell has said, in his death "soil science loses one of its most striking and original personalities. His work extended over nearly 40 years, and throughout the whole period he was noted for the freshness of his outlook and the novelty of his ideas."

Like Dr. White, Dr. Whitney was born in Baltimore, though nearly 12 years later, on August 2, 1860. While studying chemistry at Johns Hopkins University under the guidance of Dr. Ira Remsen, he decided to give his attention to the little-known field of soils and their relation to plant growth. In 1883 he became assistant chemist at the Connecticut State Station, then under the directorship of Dr. S. W. Johnson, with Dr. E. H. Jenkins as vice director and chemist, Dr. W. H. Brewer, secretary-treasurer, Dr. W. O. Atwater,

a member of the governing board, and Dr. E. H. Farrington, a coworker in chemistry, perhaps as stimulating and inspiring a group of station workers as has often been gathered together. Three years later he became superintendent of the experiment farm of the North Carolina Station, where he acquired much practical experience, and from 1888 to 1891 he was professor of agriculture in the University of South Carolina and vice director of the newly established South Carolina Station.

Dr. Whitney's earliest opportunity as an independent investigator came in 1891, when he was appointed professor of geology and soil physics in the Maryland Agricultural College and soil physicist in the Maryland Station. This station had for some time been desirous of instituting a systematic study of the agricultural soils of the State, and in his report for that year Director Alvord announced that "the station takes pride in being the first to establish a division and assign a staff officer exclusively to soil investigations and in commencing the work with such strong allies and under such auspicious circumstances."

The allies referred to were Johns Hopkins University, which had for some time actively cooperated with the station in its efforts to develop the natural resources of Maryland, and the Weather Bureau of the U. S. Department of Agriculture. The university immediately made arrangements to house the new work, at first in its geological building in Baltimore and subsequently on the Hopkins estate at Clifton, where over 400 acres of land, greenhouses, and laboratory facilities were made available.

As regards the connection with the Weather Bureau, it may be recalled that in 1891 a conference of the agricultural colleges and experiment stations was held, at which a resolution was adopted asking that the work of the Weather Bureau "be enlarged to include the physics, conditions, and changes of agricultural lands." One result of this action was the commencement of a series of bulletins issued by the Weather Bureau, the first number being contributed by E. W. Hilgard and entitled *A Report on the Relation of Soil to Climate*. The second, *Some Physical Properties of Soils in Their Relation to Moisture and Crop Production*, appeared from the pen of Dr. Whitney in 1892, following extended studies financed by the Weather Bureau, and attracted widespread attention.

Dr. Whitney inaugurated a study of the soils of Maryland, making many mechanical analyses and endeavoring to utilize his findings as a basis of soil classification. Very characteristically he broke completely away from the idea currently accepted at the time that fertility is mainly a matter of the chemical composition of the soil and struck out boldly along original lines. "Chemical analysis," he announced in his initial report, "has its part to play, but we have

yet to get the key to the interpretation of its results, and this key is to be found in the study of the physical structure of the soil and the physical relation to meteorology and to plant growth."

Upon the formal organization of soil studies by the U. S. Department of Agriculture in 1894, Dr. Whitney was appointed in charge. The Division of Soils which he built up became a bureau in 1901, but he continued to head its activities until its merging with the Bureau of Chemistry and Soils on July 1, 1927. The story of his later years is thus virtually a history of the independent soils work of the Department, and even in brief summary would far exceed the space here available. Among its distinctive achievements, however, may be mentioned the establishment of the soil survey, which has already covered in detail nearly 500,000,000 acres of the country; studies of the alkali problem of the western lands and of the feasibility of tobacco growing under shade in the Connecticut Valley; a long list of important contributions in soil chemistry, soil physics, and soil technology; and extensive investigations of fertilizers and soil amendments, including an investigation of domestic sources of materials and the methods of manufacture and application of concentrated fertilizers.

Dr. Whitney was a tireless worker, and despite serious physical infirmities maintained his interest and activity to the end. In 1925 he published his most pretentious treatise, *Soil and Civilization: A Modern Concept of the Soil and the Historical Development of Agriculture*, a book which has attained wide circulation. During his last months he prepared a number of manuscripts, one of which, dealing with the dynamics of the soil, is to appear in the Proceedings of the First International Congress of Soil Science.

As was almost inevitable with so original a thinker and so fearless a champion, more or less of disagreement and controversy followed the presentation of many of his views. Many of his conceptions seemed startling to his contemporaries and not a few proved untenable, yet his main thesis that the soil is not static but dynamic is not now seriously questioned. What is even more important, however, is that, as the *Official Record* puts it, "students of soil science generally have come to recognize that his courageous presentation of his views and conceptions has been probably the greatest influence in the furtherance of the scientific study of soils." This is perhaps because, in the words of one of his most distinguished contemporaries, "he widened the range of the subject and enriched it with ideas and analogies which, if not entirely sound, nevertheless make the investigator stop and think."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Proteins of sesame seed, *Sesamum indicum*, D. B. JONES and C. E. F. GERSDORFF (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 215-225, fig. 1).—By exhausting with 10 per cent aqueous sodium chloride solution an oil-free meal prepared from sesame seed press cake, the authors extracted the usual two globulins, accompanied by an anomalous fraction separable from the extract as a coagulum by heating to 68° C. and characterized by an ash content of over 42 per cent, together with a nitrogen content of but 12 per cent on the moisture- and ash-free basis. The large proportion of the α -globulin, of which four times as much was contained as of the β -globulin, contrasted markedly with the usual considerable preponderance of the β -globulin.

The abnormal fraction 1, besides possessing an unusually high ash content, gave the Molisch test for the presence of carbohydrate. It showed the usual protein reactions, however, with the Millon and biuret reagents, and in the xanthoproteic test. The α -globulin was found precipitable from 10 per cent sodium chloride solution by ammonium sulfate at a concentration of from 20 to 30 per cent of saturation. It was readily soluble in 2 per cent aqueous sodium chloride solution at 60°, and from this solvent the globulin crystallized in tetragonal bipyramids possessing a weak double refraction. The globulin was precipitated from its saline solutions by dilution with 10 volumes of water or by the addition of 2 cc. per 100 cc. of 1 per cent acetic acid. It coagulated from a slightly acidified solution in 10 per cent sodium chloride at 91°, and, like many α -globulins, it had a sulfur content distinctly higher than did the corresponding β -globulin.

The β -globulin could not be crystallized, being obtained always as a white, amorphous powder. It was not precipitable from saline solution by dilution, was but slightly soluble in 2 per cent sodium chloride at 60°, it coagulated from slightly acidified saline solution at 84°, and was found precipitable from 10 per cent sodium chloride solution by the addition of ammonium sulfate to the extent of 60 per cent of saturation.

On the moisture- and ash-free basis fraction 1 contained carbon 44.58, hydrogen 7.28, nitrogen 12.09, and sulfur 0.80 per cent. The composition of the large ash component of this preparation is also given. The α -globulin had the average composition carbon 53.32, hydrogen 6.74, nitrogen 18.44, and sulfur 1.28 per cent, while the corresponding figures for the β -globulin were 48.64, 6.68, 17.57, and 0.82 per cent, respectively. The amino acids determined in the three proteins were for fraction 1, the α -globulin, and the β -globulin, respectively, as follows: Arginine 8.60, 15.07, and 15.58 per cent; histidine 2.36, 2.68, and 3.45 per cent; lysine 4.04, 5.43, and 3.99 per cent; cystine 1.41, 1.94, and 1.47 per cent; tryptophane 2.72, 2.77, and 2.65 per cent; and tyrosine 4.31, 4.72, and 4.48 per cent.

On the separation of histidine and arginine.—III, The preparation of arginine, H. B. VICKERY and C. S. LEAVENWORTH (*Jour. Biol. Chem.*, 75 (1927),

No. 1, pp. 115-122).—A method for the preparation in quantity of pure arginine in yields approaching those of the quantitative method (E. S. R., 58, p. 12), of which the preparation method is a modification, is described. From 227 gm. of edestin the equivalent of 32.86 gm. of free arginine, out of 35.02 gm. estimated to be present, was isolated as the picrate and dinitronaphtholsulfonate, a recovery of 93.9 per cent.

The procedure, which is considered to make arginine one of the more readily available amino acids, may be outlined as follows: (1) After the hydrolysis of the protein (edestin is given as first choice, gelatin as second), the greater part of the acid (hydrochloric) is removed by distillation and the rest of the chlorine precipitated by the addition of silver oxide suspension in the presence of a little sulfuric acid. (2) An excess of silver oxide suspension in water is added, the acidity of the solution being maintained by the addition of dilute sulfuric acid as required. (3) The solution is brought to pH 7 with cold saturated barium hydroxide, and the precipitate, containing the histidine together with other amino acids, is removed and washed. (4) The filtrate is made acid to Congo red paper with sulfuric acid. It is again treated with excess silver oxide, and is then rendered strongly alkaline to phenolphthalein by means of hot saturated barium hydroxide. The precipitate, silver oxide, barium sulfate, and the silver salt of arginine, is removed and washed with water made alkaline with barium hydroxide. (5) The precipitate is suspended in water, the suspension is made just acid to Congo red paper with sulfuric acid, and the silver is removed by hydrogen sulfide, following which the silver sulfide is filtered off, the sulfuric acid is quantitatively removed with recrystallized barium hydroxide after boiling out the free hydrogen sulfide, and, the barium sulfate having been removed and washed, the solution is concentrated under diminished pressure to a thin sirup, from which free arginine usually crystallizes on scratching the walls of the flask.

Hydrolysis in an autoclave and the removal of the precipitates by means of a large centrifuge are recommended. By this means 250 gm. of protein may be worked up readily in five working days.

Studies on glutelins.—III, The glutelin of oats (*Avena sativa*), F. A. CSONKA (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 189-194).—This is an extension of work already noted (E. S. R., 58, p. 110). Briefly reviewing the literature of the subject, the author notes difficulty in securing satisfactory preparations of the glutelin of oats either by any of the methods previously published or by that devised by himself for the isolation of the wheat glutelin. He found that direct extraction of the oat flour with dilute alcohol yielded an extract from which ammonium sulfate precipitated oat prolamin; that cold alcohol did not extract the prolamin, while boiling 70 per cent alcohol removed the prolamin but left the glutelin in a condition such that it was practically insoluble in 0.2 per cent alkali; and that apparently the glutelin could only be satisfactorily prepared by extracting the oat flour directly with 0.2 per cent alkali, adding to the extract ammonium sulfate to make the solution one-tenth saturated; and that, upon purifying the glutelin contained in the first precipitate by redissolving this in alkali and alcohol and reprecipitating from an alcohol-alkali solution fractional with ammonium sulfate, the purified glutelin was found precipitable from solution in 0.2 per cent sodium hydroxide by ammonium sulfate at 0.018 of saturation. It contained 52.60 per cent carbon, 6.56 per cent hydrogen, 0.81 per cent sulfur, and 17.53 per cent nitrogen, and ash 0.28 per cent. By the Van Slyke (E. S. R., 26, p. 22) and other methods, 8.33 per cent arginine, 2.26 per cent histidine, 4.98 per cent lysine, and 2.99 per cent cystine were found. The isoelectric point of the glutelin was estimated as pH 6.45.

The enzymes of the velvet bean.—An insoluble tyrosinase, E. R. MILLER (*Alabama Sta. Rpt. 1924, pp. 12, 13*).—The seed coats of several varieties of velvet beans were found to contain an enzyme capable of coloring aqueous extracts of the interior substance of the bean to a pink shade very quickly, sometimes within half a minute, this initial coloration being followed by a series of changes through shades of red and brown to black. In the absence of the seed coats the extract of the ground beans showed no change in color for a long time, and the ground seed coats also failed to develop any color in aqueous suspension. The active substance was found insoluble in water and in all reagents commonly used for the extraction of enzymes, but its enzyme nature was indicated by the fact that the activity of the ground seed coats was destroyed by heating in aqueous suspension for 15 minutes at water bath temperature, and from the fact that with tyrosine solution the ground seed coats produced about the same color changes as with extracts of the interior substance of the beans it is concluded that the velvet bean seed coats contain an insoluble tyrosinase. The activity of the seed coats was weakened but not destroyed by heating in the dry state at 105° C. for 2 hours.

The manganese content of plant and animal materials, C. W. LINDOW and W. H. PETERSON (*Jour. Biol. Chem., 75 (1927), No. 1, pp. 169-175*).—This contribution from the Wisconsin Experiment Station presents data on the manganese content of 84 materials covering the principal classes of human foods. In a cursory résumé of previously reported manganese data, the authors note a lack of uniformity with respect to the analytical methods used. They themselves employed a colorimetric procedure (based upon treatment of a solution containing manganese salts with potassium periodate, which results in the formation of permanganate) of Willard and Greathouse (*E. S. R., 38, p. 204*).

The figures given range for vegetable materials from traces only in Malaga grapes, the pulp and juice of oranges, and in quinces to 216 mg. per kilogram of dry weight in northern-grown lettuce. The next largest figures are for pineapples nearly 134 mg., for beet greens (tops) practically 130 mg., and for blueberries about 122 mg. per dry kilogram. The fish and flesh food figures vary from none found in the case of bluefish, codfish, halibut, and salmon, traces only in shrimp, and none in beef spleen and round steak, to 12.2 mg. per kilogram of dry material in the case of hog liver. Some of the vegetables showed quite different values for samples of the same species and variety grown in different localities, southern-grown lettuce, for example, showing but 100 mg. of manganese per kilogram of dry weight.

Changes in the composition of protoplasmic tissue caused by partial starvation, A. G. HOGAN and W. S. RITCHIE (*Missouri Sta. Bul. 256 (1927), pp. 31, 32*).—A brief tabular report of the percentages of muscle nitrogen soluble in various salt solutions is presented, but it is considered that "the most suitable methods of extracting muscle proteins have not been determined."

The volumetric estimation of alkoxyl groups in organic compounds: A modification of the Zeisel procedure applicable to methoxyl-, ethoxyl-, and sulfur-containing compounds, E. P. EATON and E. S. WEST (*Jour. Biol. Chem. 75 (1927), No. 1, pp. 283-288, fig. 1*).—A modification of the Zeisel¹ alkoxyl estimation, in which the alkyl iodide evolved is absorbed by pyridine, the resulting pyridinium alkyl iodine oxidized with potassium iodate, and the iodine distilled and titrated with thiosulfate, is proposed. With the use of the apparatus described and figured, the method was found applicable, both to methoxyl and ethoxyl compounds, and either in the presence or absence of combined sulfur.

¹ *Monatsh. Chem., 6 (1885), pp. 989-996.*

A simple form of rotating dialyzer, N. C. WRIGHT and W. RULE (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 185-187, fig. 1).—The apparatus consists essentially of two glass funnels of equal size, the edges of which are ground to fit one another accurately, and between which the dialyzing membrane of collodion, cellophane, or parchment is held. The funnels are clamped together by means of bolts passing through wooden collars, the openings in which are cut of such size that they rest on the bodies of the funnels about half way between the edges and the stems. The apparatus is mounted with the stems of the funnels forming a horizontal axis of revolution, a pulley for belting to a motor being fixed on one of the funnel stems, both of which rest in ring-stemmed clamps which serve as bearings. The ends of the funnel stems are closed by small stoppers or by pieces of rubber tubing provided with pinchcocks. A bubble of air left on each side of the diaphragm when filling the apparatus provides for the efficient stirring of the liquids as long as the cell is kept rotating. It is noted that a number of dialyzers of this type may be run simultaneously from the same motor, a battery of four having been successfully operated by the authors in this way. A drawing, which should be consulted in setting up the apparatus, accompanies the note.

METEOROLOGY

Performance in long-range weather forecasting, C. F. BROOKS (*U. S. Mo. Weather Rev.*, 55 (1927), No. 9, pp. 390-395).—This article reviews and gives a considerable bibliography of the subject of long-range weather forecasting from various standpoints. It is stated that "a forecast that will not hit the mark four times out of five, or at least once out of every three in succession, can not be of much value, though some claim that a forecast verified only three times out of five would be useful. The uncertainties of meteorological relationships on which any long-range forecasts can now be based are generally too great to permit reputable meteorologists to forecast on expectations of less than 75 or 80 per cent verification. A critical study of the methods now used in the attempts at scientific long-range weather forecasting and an evaluation of their relative merits for different parts of the world is much needed."

The floods of 1927 in the Mississippi Basin, H. C. FRANKENFIELD ET AL. (*U. S. Mo. Weather Rev. Sup.* 29 (1927), pp. 49, illus. 22).—The causes, character, and damage of the floods of 1927 in the central and southern parts of the Mississippi Basin are discussed in detail. This flood, referred to as surpassing "any previous overflow below Vicksburg in something like 200 years," is explained as due to heavy rains over the central and lower valleys of the Mississippi Basin, beginning in the latter part of December, and the added fact that "for more than three months previous to the late December rains the principal streams had been very much above their normal low stages for that season of the year, and were still comparatively high when the rains began."

The total rainfall over the drainage basin from December 18, 1926, to April 30, 1927, was 12.38 in., equivalent to 244.4 cubic miles of water. The estimated area of crop lands overflowed was 4,417,500 acres, a little more than 24 per cent of the total overflowed area of 18,286,780 acres. Of the overflowed crop lands about 2,600,000 acres were in cotton, 1,100,000 in corn, 360,000 in hay, and 357,500 in other crops. The flood was responsible for loss of over 300 lives and for economic damage estimated at over \$355,000,000, indicating that this flood "was the greatest economic disaster in the history of the United States."

The observed facts with reference to this flood bear out the general conclusion that "the great floods in the Mississippi have all occurred when a flood in

the Ohio River has been augmented by subsequent rains over the contiguous areas of the central basins. . . . The Mississippi floods follow excessive rains over that portion of the basin below the mouth of the Wisconsin and Platte Rivers, and roughly east of the ninety-seventh meridian. This . . . leaves entirely out of consideration conditions and effects arising in the Rocky Mountain headwater system of great tributaries like the Missouri, Arkansas, and others. Under present climatic and meteorological conditions, neither precipitation nor melting snow in these mountainous and forested areas can reasonably add more than a very small fraction to a flood crest in the lower Mississippi. . . . It is, therefore, heavy rains over the central and lower valleys of the Mississippi basin which both explain and fully determine the character of Mississippi floods."

Frankenfield on the 1927 floods in the Mississippi Valley, A. J. HENRY (*U. S. Mo. Weather Rev.*, 55 (1927), No. 10, pp. 437-452, pls. 2, figs. 4).—This is a condensation of the above report.

The season in the corn and cotton belts (*U. S. Dept. Agr., Weather Bur., Weekly Weather and Crop Bul.* 52 (1927), pp. 2, 3, 4, figs. 2).—Graphs are given which show the 1927 weekly rainfall and departures of temperature from normal for each week in the principal corn and cotton States for the respective periods of April to September and May to October, inclusive. These indicate that conditions were generally favorable in the western portion of the Corn Belt, but for the most part unfavorable in the eastern portion. The outstanding features of the season in the cotton States were the uniformly moderate temperatures during the first and middle parts of the season and wide variations during the latter part. There were a number of weeks of excessive rainfall in Oklahoma, Louisiana, and Arkansas, but there were in general no extended periods of excessive rain. From the Mississippi Valley eastward there was a rather marked tendency to deficiency in rainfall during the latter part of the season, especially in the southeastern portion of the belt in September.

Weather reports, C. C. GEORGESON ET AL. (*Alaska Stas. Rpt.* 1926, pp. 11, 19, 30, 31-40).—Monthly summaries of temperature, precipitation, and cloudiness recorded at 41 places in Alaska are given for the calendar year 1926, with brief notes on the seasonal weather conditions and their effect on crops at the different experiment stations.

The season of 1926 in the Tanana Valley, where the Fairbanks Station is located, was favorable. "The last killing frost in the spring occurred May 24 and the first killing frost in the fall September 16, giving a frost-free period of 115 days. The freeze was not hard enough to stop fall plowing before October 13. The rainfall was slightly lighter than normal, and the summer temperature in consequence was a trifle higher than normal."

At the Matanuska Station "the maximum temperature, 84° F., occurred in June, and the minimum temperature, -14°, in February. The rainfall during May and June, 1926, totaled only 0.94 in., which is sufficient for grain crops. During July and August a rainfall of 7 in. seriously interfered with harvesting. The summer of 1926 was typical of Matanuska. Spring began early. The last frost in spring occurred April 23, and the first killing frost in the fall, October 7, making a frost-free period of 162 days. Summer frosts, such as are peculiar to the northern tier of States and Canada, have not been found to occur at Matanuska in 9 years."

"The season was unusually rainy at Kodiak. During the calendar year the precipitation amounted to 77.8 in. The average for 18 years is 61.3 in. The coldest day was 3° and the warmest day was 81°. The growing months

from May to September, inclusive, had 19 clear days, 10 of which were in June."

Climatological data for the United States by sections, [July–August, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14* (1927), Nos. 7, pp. [194], pls. 4, fig. 1; 8, pp. [194], pls. 4, fig. 1).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1927.

Monthly Weather Review, [September–October, 1927] (*U. S. Mo. Weather Rev., 55* (1927), Nos. 9, pp. 387–436, pls. 14, figs. 12; 10, pp. 437–483, pls. 12, figs. 8).—In addition to detailed summaries of meteorological and climatological data and weather conditions for September and October, 1927, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 9.—The Prague Meetings of the International Geodetic and Geophysical Union and Its Meteorological Section, by H. H. Kimball (pp. 387–390); Performance in Long-Range Weather Forecasting, by C. F. Brooks (pp. 390–395) (see p. 412); Berlage on East Monsoon Forecasting for Java (illus.), by A. J. Henry (pp. 395–398); Recent Contributions to Hygrometry, by S. P. Fergusson (pp. 398–400); Climate as Totality of the Weather (illus.), by E. E. Fedorov, trans. by E. S. Nichols (pp. 401–403); Frequencies of Weather Types at San Jose, Calif. (illus.), by E. S. Nichols (pp. 403–405); The St. Louis Tornado of September 29, 1927 (illus.), by M. W. Hayes (pp. 405–407); Meteorological Conditions over the Sea in the Eastern Mediterranean (illus.), by H. Meredith (pp. 407–409); Ice Forecasting by Means of the Weather (illus.) (pp. 409, 410); and Outline of the Article on "The Climatic Regions of Eastern North America" (illus.), by W. Van Royan (pp. 410–412).

No. 10.—Frankenfield on the 1927 Floods in the Mississippi Valley (illus.), by A. J. Henry (pp. 437–452) (see p. 413); Some Inundations Attending Tropical Cyclones (illus.), by I. R. Tannehill (pp. 453–456); The Relation of Spring Temperatures to Apple Yields (illus.), by W. A. Mattice (pp. 456–459); On the Measure of Correlation, by G. T. Walker (pp. 459, 460); and Note on the Theorems of Dines and Walker, by E. W. Woolard (pp. 460, 461).

SOILS—FERTILIZERS

Soil survey of Worcester County, Massachusetts, W. J. LATIMER, R. F. R. MARTIN, and M. O. LANPHEAR (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1531–1594, pls. 3, fig. 1, maps 2*).—Worcester County, in central Massachusetts, extends entirely across the State from north to south, and covers an area of 974,080 acres. Gloucester stony fine sandy loam, 11.1 per cent of the total area, and 9.9 per cent of rough stony land are the largest individual soil groups, the entire survey showing 10 series of 24 types, exclusive of unclassified areas of muck 5.7, and meadowland 5.1 per cent.

With respect to topography, the county consists of two plateaus extensively dissected by a previous drainage system. Drainage varies from poor in the Whitman stony loam soils, found in low areas, to excessive in the Hinckley series, which occurs on outwash areas having a hummocky topography.

The effect of texture of sandy soils on the moisture supply for corn during seasons of favorable and unfavorable distribution of rainfall, H. W. STEWART (*Soil Sci., 24* (1927), No. 4, pp. 231–238, pl. 1, figs. 2).—Observations reported in a previous paper (E. S. R., 55, p. 810) are discussed, and a table is given showing the mechanical compositions of Coloma sand, Coloma fine sand, and Coloma sandy loam and a graphic representation of the average yields of air-dried corn during seasons of good and of poor rainfall distribution on these soils in two series of plots.

Three types of rainfall distribution are recognized: (1) Infrequent heavy rains and light showers, (2) infrequent heavy rains with frequent light showers, and (3) frequent light showers. Corn yields under the first type of distribution were found to be highest on the sandy loam, intermediate on the fine sand, and lowest on the medium sand. Under the second type of rainfall distribution the sandy loam gave the highest yields, those from the medium and fine sands being the same. Under the third type of rainfall supply, however, while the sandy loams still gave the highest yields, the intermediate results were obtained on the medium sand and the lowest yields from the fine sandy soil. Following a drought, the moisture content of the three soil types closely approached the wilting coefficient to a depth of 3 ft.

Studies of the tight clay layer in the soils of the level prairies of Missouri, R. BRADFIELD (*Missouri Sta. Bul. 256 (1927), p. 94*).—From recent laboratory studies are drawn the conclusions (1) that neutral coagulants are effective in quantities much smaller than those required in case of such alkaline compounds as calcium carbonate; (2) that coagulation values are practically independent of the soil-water ratio in the case of neutral salts and directly proportional in the case of alkaline salts; and (3) that the coagulation value is greatly influenced by base exchange between the added electrolyte and the clay. In support of the last-stated conclusion it is noted that the coagulation values in experiments in which potassium hydroxide was used as a flocculent were increased by more than 500 per cent by the electrolytic removal of the exchangeable divalent bases.

Hungarian alkali soils and methods of their reclamation, A. A. J. DE SIGMOND (*California Sta. Spec. Pub., 1927, pp. IV+156, figs. 9*).—An English edition of this important monograph, originally published by the Hungarian Academy of Sciences in 1923, is here presented. The translation, by S. de Finall, has been supervised, abbreviated, and revised by the author, with a foreword by W. P. Kelley.

The monograph deals with the origins and modes of formation of alkali soils, as well as with the distribution of alkali soil types in Hungary, the chemical and physical properties of various forms of alkali soils, the flora adapted to the various alkali soil types under Hungarian conditions (characterized by relatively long and cold winters, with much of the precipitation in the form of snow), and finally with the methods for the reclamation of alkali soils. The principal captions are as follows: The alkali (szik) soils as a typical soil formation (pp. 1-34); the distribution, extent, and types of szik soils (pp. 35-77); physical, chemical, and biological properties of different szik soil types (pp. 78-114); and the reclamation of the szik soils (pp. 114-156).

In addition to physical and chemical means for the reclamation of alkali soils, the author suggests the cropping of such land to various plants capable of absorbing large quantities of salts commonly abundant in alkali soils. Some of these plants, for example, Russian thistle, may take up salts equivalent to an ash content of 20 per cent or more, so that by systematic cropping considerable amounts of salts may be removed.

The maintenance of crop production on semi-arid soil, F. J. SIEVERS and H. F. HOLTZ (*Washington Col. Sta. Pop. Bul. 138 (1927), pp. 29, figs. 24*).—This bulletin offers recommendations for the improved management of soils of eastern Washington, which show a very evident depletion after only 40 years of cropping under the prevailing system. These recommendations are intended to lay the foundation of a more permanent type of agriculture than is possible under the destructive summer-fallow system now in practice. The subjects discussed are as follows: Precipitation and its influence; moisture penetration

and distribution in the soil; evidence of soil depletion; influence of summer fallow tillage; essentials of good summer fallow; clean summer fallow; effectiveness of June rain on summer fallow, and of June rain on the crop; effect of nitrogen fertilizers; relief for depleted soils; crop substitutes for summer fallow; limitations to continuous wheat cropping; peas compared to corn as a summer fallow crop; alfalfa v. summer fallow; residual effect of legumes; nitrogen fertilizing value of alfalfa; excess nitrogen and "burning"; special treatment for legumes; effect of rate of seeding on tillering; effect of nitrates in tillering; quality in wheat; water requirements as influenced by plant growth; proper depth of plowing; depressing effect of straw on wheat yield; utilization of straw or strawy manure in soil; and organic matter maintenance.

Soil acidity studies, C. R. RUNK (*Delaware Sta. Bul. 152 (1927), pp. 6, 7*).—Determinations of the acidity of Delaware soils have shown these soils to range from neutral to strongly acid, the Portsmouth, Elkton, St. John's, Keyport, and Cecil series averaging higher in acidity than the remaining soils of the State. Most of the cropped soils showed only medium to slight acidity, however.

The buffer capacity of each soil type found in the State has been determined with respect both to acids and to alkalies. Buffer capacity was found to show a wide range of variation in Delaware soils, some being capable of resisting the acidity altering effect of large additions of lime or fertilizer materials without appreciable disturbance. Others, having little buffer capacity, "are very easily thrown out of balance, and these soils must be handled carefully."

In field experiments on the relation of acidity to crop growth, very poor stands and growth of alfalfa were secured in plats maintained at the pH values 7.8, 7.3, and 6.8. The best stand and growth were obtained in plats showing a soil pH value of from 6.5 to 5.4.

The buffer capacity method for the determination of the lime requirement (E. S. R., 54, p. 214) was compared with other procedures in tests on 165 soils. No agreement among methods was found, but the buffer capacity determination appeared to show more promise of improvement in the laboratory estimation of lime requirements than did any other method yet tried.

A fundamental study of the mechanism of buffer action in soils, P. B. MYERS and G. M. GILLIGAN (*Delaware Sta. Bul. 152 (1927), pp. 18, 19*).—The work of this station on pectin (E. S. R., 57, p. 592) having shown the buffer action of pectin solutions to be due not to the colloids but entirely to the impurities retained by them, preliminary experiments on soil colloids to ascertain if the same conditions are to be found in soils have been made. Electrodialysis of the colloidal fraction of a Portsmouth loam high in organic matter demonstrated that with the progressive removal of electrolytes from the organic colloidal material the buffer action showed a concomitant decrease until, when an organic colloidal fraction almost free from impurities had been obtained, the buffer action was practically nil. The assumption, based on the fact that buffer action is known to be more or less proportional to the colloidal content, that soil buffer action depends principally on the soil colloids is no longer considered tenable.

Investigation of the properties of colloidal material in Missouri soils, R. BRADFIELD (*Missouri Sta. Bul. 256 (1927), pp. 94-96*).—In the case of the noncalcareous nonsaline soils investigated, electrodialysis and the method of extraction with the neutral salt solution gave identical results, and the electrodialytic procedure was found quicker, especially with heavy soils. This method also avoids direct solution effects, water only being added to the soil; it permits the easy quantitative removal of carbonates; it simplifies analysis of the bases

by converting them all into hydroxides and by eliminating the excess of extractant base; and it leaves the original soil saturated with the H-ion so that saturation with any base to any desired degree can be secured by a suitable addition of the hydroxide of the base in question. Placing a sample of the electrodialyzed clay sol in an electrolyte-free collodion bag suspended in distilled water caused practically no change in the H-ion concentration of the water (pH 6.0 to 7.0), while the sol retained a pH value of from 3.0 to 3.5, corresponding membrane potentials having been demonstrated by preliminary measurements. It was also found that the perfectly clear supernatant liquid over electrodialyzed clay was practically neutral, while the clay itself usually had a pH value of about 3.0.

In determinations of the saturation capacity of the soil by titrating samples saturated with H-ion by electro dialysis, it was found that colloidal clay sols gave satisfactory end points in either conductometric or potentiometric procedures when sodium hydroxide was used, but only in the potentiometric method when the titration was made with barium hydroxide.

The absorption of phosphates by electro dialyzed colloidal clay and the size distribution of the particles in colloidal clay were also studied, the former with C. A. Roszmann.

The effect of absorption by plants on the concentration of the soil solution, C. S. SCOFIELD (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 8, pp. 745-756).—This paper reports a study of some factors of irrigation theory and practice planned by the U. S. D. A. Office of Western Irrigation Agriculture and carried on at the University of Arizona by J. F. Breazeale and H. V. Smith. The work was designed to test the validity of two assumptions with respect to irrigation practice (1) that crop plants absorb the soil solution, both the water and its dissolved salts, substantially as it occurs in the soil; and (2) that the ideal irrigation system is one supplying to the soil only water enough to moisten the root zone to its water-holding capacity, in order to supply the needs of crop plants and to meet evaporation losses. Attention is drawn to the dependence of the second of these assumptions upon the first.

The experiments were designed to determine (1) whether plants whose roots are in contact with a concentrated nutrient solution take up the water and the electrolytes at the same rate, and (2) if the water is absorbed more rapidly than the salts from even dilute solutions (which was found to be the fact), to ascertain if the difference in absorption rate varies with the concentration of the solution. The work consisted essentially in growing groups of 25 wheat or barley seedlings selected for uniformity in size and vigor, on the nutrient solution, obtained by leaching with distilled water a field surface soil, under conditions designed to prevent loss by evaporation. The pH values, conductance data, etc., were determined at the beginning of the experiment and after various intervals up to 24 days.

"The results of these experiments appear to warrant the conclusion that crop plants do not absorb water and dissolved substances from the soil solution in the same proportions that these constituents occur together in that solution." The residual solutions were found to be definitely more concentrated than the original solution, and, although the quantity of water absorbed from the culture solution was about equal to the original volume of the culture solutions, yet there remained in the residual solutions from 78 to 91 per cent of the salts originally present.

It is believed that, though these experiments were made with culture solutions in the laboratory, the results are none the less fairly applicable to field conditions. The fallacy, in the light of these results and conclusions, of the

irrigation theory that when saline waters must be used for irrigation they should be applied as sparingly as possible is discussed. Leaching being the only known means for the removal of excess salts from the soil, accumulation from saline irrigation waters can only be prevented by providing such water, when it must be used, in quantities sufficient to offset as nearly as possible the selective absorption of water by the plant.

"Most of the ordinary crop plants are not able to absorb the water needed for normal growth from a soil solution containing more than 1.5 to 2 per cent of salts. This means that if the irrigation water contains as much as 1,500 to 2,000 parts per million of salt, a sufficient quantity of it should be used so that at least 10 per cent of the quantity applied to the surface of the soil will percolate down through the root zone."

Percentage of carbon dioxide in soil air, C. O. APPLEMAN (*Soil Sci.*, 24 (1927), No. 4, pp. 241-245, fig. 1).—Determinations of the carbon dioxide of the soil air showed that the incorporation of organic matter in potato rows increased the soil carbon dioxide. The increase was much smaller under the early crop than under the plants of the late crop, the percentage of carbon dioxide rising under the latter conditions to 6.9 in one of the rows to which organic matter had been added. This difference is attributed to the greater moisture content of the soil during the wet season with the late crop, the higher moisture contents being supposed to favor both the rapid decomposition of the added organic matter and the accumulation of the resultant carbon dioxide in the soil atmosphere. In the control rows, to which no organic matter had been added, the rather large maximum figure of 5.05 per cent of carbon dioxide in the soil air is considered to be in large measure due to the fact that the air samples were taken as near as possible to large seed pieces, the high respiration of which, it is believed, contributed considerably to the amount of the carbon dioxide. This observation was made about the middle of July. Cultivation of the late crop nearly at the end of July was found to reduce the carbon dioxide content of the soil air by more than 90 per cent, both in the organic matter rows and in the control rows, an effect considered to be a remarkable demonstration of the effect of cultivation upon aeration after wet weather.

In the row containing the highest percentage of carbon dioxide, the seed pieces of the late crop all sprouted, but yielded plants only 4 in. high when those of the control row were 8 in. high. When the soil carbon dioxide had been greatly reduced by cultivation the backward plants began vigorous growth and practically caught up with the control plants.

A report of potatoes failing to sprout in plowed sod during a wet season, which report prompted the performance of the experiments here reported, is considered not capable of explanation on the basis of carbon dioxide accumulation, since even the highest concentration of carbon dioxide in the late-crop soil did not prevent the tubers from sprouting.

Nitrates and wheat yields after certain crops, P. E. KARRAKER (*Soil Sci.*, 24 (1927), No. 4, pp. 247-258).—Report is made of nitrate determinations, covering 5 years, on the soils of a crop rotation experiment conducted at the Kentucky Experiment Station with the purpose of ascertaining the effect of various rotations, and especially of the immediately preceding crop, upon the wheat yields. The wheat followed corn, tobacco, or soy beans, and other variations were made in the rotations. The nitrate determinations were made when the wheat was seeded in the fall. The last 3 years of the study indicated a fairly close relationship between the soil nitrates at this period and the subsequent wheat yield, but considering the results by years, and especially taking

the first 2 years of the experiment into consideration, it is stated that the relationship was found to be only very general and to show at numerous points no correlation.

The variable occurrence of nitrates in soils, P. E. KARBAKER (*Soil Sci.*, 24 (1927), No. 4, pp. 259-262, figs. 3).—Considerable variations in the results of nitrate determinations on samplings of consecutive dates having been observed in the last year of the work noted in the preceding abstract, the present preliminary work on local variations in the nitrate content of the rotation plats was undertaken. Large differences were observed within comparatively short distances, and it is considered, on the basis of the figures given, that the variation is likely to be as great at short as at relatively great distances between points of sampling. The order of magnitude of the variations corresponded in general with that of the average nitrate content of the plats. Variability in the occurrence of nitrates appeared to be in no way correlated with possible differences brought about by cultivation of the corn or tobacco crops on the areas studied, nor with varying residual effects from stubs and roots.

[Soil management experiments in Missouri] (*Missouri Sta. Bul.* 256 (1927), pp. 86-94, figs. 3).—These progress reports include, among others, the following subjects:

The rate of accumulation and cost of nitrogen and carbon in soils under different systems of green manuring and cropping, M. F. Miller and H. H. Krusekopf.—From the results of an especially careful sampling and analysis of the soils of plats used in these experiments, it is concluded that under the climatic conditions of central Missouri "it apparently was not practical to maintain the nitrogen supply of the average soil at a high level. . . . The rate of decay of organic matter appeared to be too rapid. Providing a large nitrogen turnover from crop residues, legumes, and manures seemed to be more important."

Crop rotation and fertilizer experiments, M. F. Miller and H. H. Krusekopf.—Soil treatment experiments of the usual type are summarized, together with the resulting yields.

Studies of water absorption, runoff, percolation, evaporation, capillary water movement, and soil erosion under field conditions, H. H. Krusekopf.—The data obtained during the year's work here reported, confirm previous results (*E. S. R.*, 57, p. 411).

The effect of different amounts and different methods of applying commercial fertilizer on the corn crop, M. F. Miller and H. H. Krusekopf.—Eight years of a 2-year rotation of corn and soy beans proved unsatisfactory, the increase from the use of commercial fertilizers being only 3.5 bu. per acre. A 2-year system of corn and small grains with sweet clover sown in the small grain and turned under for the next year's corn raised the average increase from the use of commercial fertilizer to 8.6 bu per acre, with some much larger increases. The improvement is attributed to the supplying of the nitrogen deficiency by the sweet clover, permitting the phosphorus of the fertilizers to bring about much larger returns.

An experiment for the purpose of determining the proper fineness of grinding of limestone, M. F. Miller and H. H. Krusekopf.—The best results in liming for sweet clover were secured when the lime was applied several months before seeding the clover.

Studies on the longevity of Bacillus radicicola in the soil, W. A. Albrecht.—*B. radicicola* was not able to inoculate sterile seeds after the soil containing it had been stored dry for 7 years, but storage of a soil of normal moisture content left the organism capable of excellent inoculation after 7 years' absence of the host plant.

The effect of weathering and storage upon the composition of barnyard manure, W. A. Albrecht.—The composting of straw and leaves with a patented chemical mixture and with chemicals known to be essential for the laboratory decomposition of cellulose, rains supplying the necessary moisture, yielded a manure which gave excellent results on wheat and had a good effect on the stand of alsike clover. The total nitrogen in the dry matter and the amount and proportion of the nitrogen soluble in water or mild reagents increased during the decomposition in the treated straw, but in the untreated straw the readily soluble nitrogen decreased during decomposition.

The influence of ammonium sulphate as a direct source of nitrogen for apple trees, M. B. DAVIS (*Sci. Agr.*, 8 (1927), No. 1, pp. 41-55, figs. 3).—The first and second year results of pot experiments started in 1925 on the comparative utilization of ammonium sulfate and other sources of nitrogen by 2-year Melba apple trees in the absence of nitrifying organisms, and first year results of similar experiments of 1926, are presented, and the data are analyzed for the determination of the mathematical odds in favor of or against each of the sources of nitrogen used as compared with other forms of nitrogen supply and of a nutrient mixture supplying no nitrogen. The trees were sterilized by 2 hours' treatment with 2 parts in 1,000 of mercury bichloride to kill nitrifying organisms attached to the roots, and were then planted in pure ground sandstone and supplied with a nutrient solution containing magnesium sulfate, monopotassium phosphate, potassium chloride, calcium chloride, calcium sulfate, and, in the 1925 series of experiments, either 7.5 gm. of sodium nitrate, 5.1 gm. of ammonium sulfate, or no nitrogen compound of any kind. In the 1926 experiments a cyanamide group was included, together with experiments in which the trees were potted in soil.

The evidence obtained, as summarized by the author, is in part as follows: (1) The availability of ammonium-sulfate nitrogen in the absence of nitrifying organisms could not be demonstrated. (2) When nitrifying organisms appeared in the substratum, ammonium sulfate gave as good apparent growth responses as did sodium nitrate. (3) When the nitrogen compounds were applied in quantities apparently in excess of the optimum concentration toxic effects were observed, these decreasing in the order cyanamide, ammonium sulfate, and sodium nitrate. It is concluded that ammonium sulfate will become available on very poor sand in the presence of nitrifying organisms.

[Potash for soy bean chlorosis], C. R. RUNK (*Delaware Sta. Bul.* 152 (1927), p. 7).—Potassium salts applied at the time of planting and as side dressings yielded marked results in the prevention of chlorosis of soy bean plants. Other salts used showed no corrective effect.

[Oxidation activators in sulfur floats composting], T. F. MANNS (*Delaware Sta. Bul.* 152 (1927), pp. 51-54).—The composts consisted of 6,000 gm. of muck air-dried and containing about 50 per cent of moisture, 2,000 gm. of tricalcium phosphate, and 600 gm. of inoculated sulfur, the experiments having been carried out in jars of about 10 kg. capacity. The most effective activators tried were the sulfates of potassium, ammonium, ferrous iron, aluminum, and magnesium. The sulfates of copper, lead, tin, and barium were activators in small quantities. A number of other metals were inhibitive, even as sulfates, however, and cyanamides and chlorides were strongly inhibitive for several weeks after the mixing of the materials. A table showing the degree of solubilization of the phosphorus of floats with various activators and in the absence of activators is appended.

Testing fertilizers, spring 1927, L. D. HAIGH (*Missouri Sta. Bul.* 257 (1927), pp. 11).—This bulletin presents the usual annual report of fertilizer

analyses, together with some recommendations regarding the use of fertilizers on Missouri soils, by M. F. Miller.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1927, C. S. CATHCAET (*New Jersey Sta. Bul.* 456 (1927), pp. 39).—The usual tabulated analytical information is given, together with the costs per pound of actual nutrients in a number of unmixed fertilizer materials examined.

Inspection of fertilizers, J. B. SMITH and W. L. ADAMS (*Rhode Island Sta. Ann. Fert. Circ.*, 1927, pp. 12).—This contains the usual tabulation of guaranties and of nutrients actually found with respect to fertilizers offered for sale in Rhode Island for the period covered, together with similar information regarding limes, gypsum, and ashes.

AGRICULTURAL BOTANY

The genesis of carbohydrates in plants [trans. title], A. H. COLIN (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 373-375).—Brief discussion is given of seasonal or other influences and variations in carbohydrate production.

Relation of glycogen to spore-ejection, L. B. WALKER and E. N. ANDERSEN (*Mycologia*, 17 (1925), No. 4, pp. 154-159, pl. 1).—An account is given of studies on three forms of *Sphaerobolus*.

Early work indicated that the forceful ejection of the spore mass was due to a high osmotic pressure developed in the collenchyma layer, but it has been shown that only the inner peridial layer could have any part in effecting the final discharge. Tests showed that the collenchyma layer before and at the time the fruit body opens is densely filled with glycogen. "It is interesting to note that the opening of the fruit body itself is due to the change of glycogen to sugars in an outer layer. . . . Aside from the rôle of glycogen when transformed into sugars in bringing about spore ejection, similar transformations take place in other parts of fruit bodies and cause the sudden enlargement of cells that results in the expansion of the fruit body. . . . We have evidence that one of the primary functions of glycogen, when transformed into sugars, is to create osmotic pressure which results in a sudden enlargement of cells in vegetative tissues of fungi, and is, at least in many cases, the direct cause of the forceful ejection of spores and spore masses in reproductive parts."

Migration of alkaloids in lupines [trans. title], A. GUILLAUME (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 547-549).—An account of methods, their applications, verification, and results is given in connection with conditions of illumination, nutrition, and altitude.

Physiology of sweet potatoes (*Alabama Sta. Rpt.* 1924, pp. 11, 12).—Studies by W. A. Gardner are reported on sweet potatoes, in which it was found that in stored sweet potatoes the sucrose increased gradually from 3.3 per cent on October 17 to 6.4 per cent on February 21. The increase was quite rapid during the first week, after which it slowed down and decreased until February 21. The results of the investigation are said to indicate that during the maturation period of sweet potatoes the percentage of sugar and starch increases but the percentage of moisture decreases. Immediately after harvesting, whether cured or not, the potatoes lose moisture and the percentage of sugar and starch increases, the rate of increase depending upon the conditions of storage.

Zonation in cultures of *Fusarium discolor sulphureum*, G. R. BISBY (*Mycologia*, 17 (1925), No. 3, pp. 89-97, pl. 1).—In cultures of *F. discolor sulphureum* zonation resulted from the influence of light or temperature. An exposure of *F. discolor sulphureum* to bright daylight for from 0.25 to 0.5

second produced a ring of conidia which could be detected by the naked eye. A 6-minute exposure to the light from a 25-candlepower carbon lamp at 1 meter distance was required to produce a noticeable ring, but an exposure of from 2 to 2.25 minutes to a tungsten-flament lamp of about the same candlepower sufficed to induce the zone formation. The light acts upon the outermost tips of the hyphae, and the phenomenon is, at least in part, another case of the effect of light upon growth. Zonation may also be induced by alternating temperature in constant darkness.

Some effects of sulfuric anhydride on vegetation [trans. title], P. CHOUARD (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 342-345).—On May 26, 1925, a large quantity of sulfur dioxide escaped from a reservoir, and the present account notes the effects on various plants.

Danger in using tar in aqueous solution on plants [trans. title], L. RAYBAUD and C. DUPONT (*Assoc. Franç. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 384-386).—Within plant families great variation was noted as regards the injury reaction to the indicated composition percentage of tar.

Responses of plant tissues to electric currents, H. H. DIXON and T. A. BENNETT—CLARK (*Notes Bot. School Trinity Col., Dublin 4* (1927), No. 1, pp. 33-54, figs. 13; abs. in *Brit. Assoc. Adv. Sci Rpt.*, 94 (1926), p. 405).—An electric current causes in a tissue a change in electrical resistance and a change in permeability, the quantitative aspects of which have been investigated. A moderate stimulus (120 volts for 0.1 second) is immediately followed by a very rapid fall in resistance which becomes less and less rapid. After a few minutes, the resistance rises somewhat and falls again, finally beginning to rise slowly and recovering in about an hour the value it had before stimulation. Both a positive and a negative deviation of resistance are initiated by the stimulus, and their relative magnitudes depend on the magnitude of the stimulus. The positive reactions predominate only within a small range of intensities of stimulus, and only when the energy content of the stimulus is less than 0.01 joule under the conditions of the experiments. When stimuli are used, all of which are of the same energy content, it is found that the higher the intensity at which this energy is supplied to the tissue the more effective it is. The relation between the intensity and the response is S-shaped, and it is suggested that a given quantity of energy produces in any cell a definite alteration of resistance whatever the voltage at which it is supplied. It is supposed that the ability of a current to stimulate a cell is determined by the potential difference across the membranes of the cell. A series of stimuli applied to a single leaf square evokes the same response as a single stimulus having a duration equal to the combined durations of the stimuli in the series, provided that the intervals between these stimuli are not too long. Advance of the season and rise of temperature greatly increased the sensitivity of the tissues, but the positive and negative reactions were not affected to the same extent.

Tests of radiotherapy in plants [trans. title], V. RIVERA (*Bol. R. Staz. Patol. Veg. [Rome], n. ser.*, 6 (1926), No. 4, pp. 337-345, figs. 2).—In studies subsequent to those previously noted (*E. S. R.*, 56, p. 629), the action of the rays (details and graphs of which are given) was strictly localized.

The action of ultra-violet radiation on zoospores of *Blepharospora cambivora* and *Phytophthora omnivora parasitica* [trans. title], J. DUFRÉNOX (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 4, pp. 270-273, figs. 5).—The effects of ultra-violet rays on unprotected, partly protected, or briefly protected zoospores of *B. cambivora* and *P. omnivora parasitica* are indicated, with a list of 10 related publications.

GENETICS

The germplasm and its architecture, F. A. E. CREW (*Nature* [London], 120 (1927), Nos. 3028, pp. 696-698; 3029, pp. 732-734).—The author points out the progress which was made prior to and after the discovery of Mendell's law in the final location of certain genes on chromosomes through crossing over, especially in *Drosophila*. The action of the genes is now understood as an expression of the relation of genetic units rather than an individual action of the genes per se. This has been especially well demonstrated in the case of sex chromosomes.

The newer discoveries of the possibilities in the induction of chromosome rearrangement and mutations by X-rays are discussed. Further advances in genetics appear to lie more along the line of developmental physiology.

Chromosomes in *Vaccinium*, A. E. LONGBLEY (*Science*, 66 (1927), No. 1719, pp. 566-568, fig. 1).—Of 12 *Vaccinium* species and hybrids examined by the U. S. Department of Agriculture in respect to chromosome number, 3 were diploid, 6 tetraploid, 1 pentaploid, and 2 hexaploid, with an indicated basic number of 12. Chromosome behavior was regular except in the pentaploid form, where for the greater part the mother cells were found to be much vacuolated and the reduction phases irregular, giving as a result polycary, polyspory, and very little normal appearing pollen.

Blueberry chromosomes, F. V. COVILLE (*Science*, 66 (1927), No. 1719, pp. 565, 566).—A brief discussion of the blueberry breeding operations of the U. S. Department of Agriculture and of the possible value of chromosome examination as an index to compatibility between species and forms. A cross between *Vaccinium corymbosum* and *V. virgatum* resulted in sterile hybrids with 30 chromosomes, the pentaploids of the above paper.

Chromosome number and the relationship of species in the genus *Viola*, J. CLAUSEN (*Ann. Bot.* [London], 41 (1927), No. 164, pp. 677-714, figs. 82).—An examination of the pollen mother cells of approximately 30 species of *Viola* at the Royal Veterinary and Agricultural College, Copenhagen, revealed a wide range in the haploid chromosome number, from 6 to 36, falling, however, into more or less definite groups, 6, 10, and 12 series. Emphasis is placed on the importance of the chromosome number and behavior in species hybrids as a means of delimiting species.

Bud mutations in the potato and their chimerical nature, T. ASSEYEVA (*Jour. Genetics*, 19 (1927), No. 1, pp. 1-26, pl. 1, figs. 7).—The behavior of eleven bud mutations in studies at the Institute of Applied Botany, Detskoe Selo (U. S. S. R.) gave indications that all investigated were periclinal chimeras in character. Bud mutations in the potato varied in frequency of occurrence in different varieties and also in the manner of expression. Some of the common potato varieties appeared to be chimeras. Pertinent work of other investigators is also discussed.

Genetic and cytological studies in wheat, IV, A. E. WATKINS (*Jour. Genetics*, 19 (1927), No. 1, pp. 81-96, pl. 1).—Further investigations (E. S. R., 57, p. 822) into the genetics of a cross between *Triticum vulgare* and *T. turgidum* are described. By back-crossing the F_1 a complete analysis was possible, since all F_1 egg cells are fertile and all kernels from the cross $F_1 \text{ } \varnothing \times \text{turgidum } \text{ } \delta$ germinate. With certain exceptions the characters studied showed that usually normal pairing and segregation occurs between homologous *turgidum* and *vulgare* chromosomes.

The difference between the keeled glume of *turgidum* and the round glume of *T. vulgare* appeared due to a single factor, *K*, showing normal segregation,

turgidum being *KK* and vulgare *kk*. Turgidum forms with a round glume (28-chromosome-*kk*) extracted from the cross had a very dense ear and thin papery glumes, while keeled vulgare forms extracted from the cross (42-chromosome-*KK*) had a very lax ear and tough glumes, being of the speltoid type. Rough (*RR*) and smooth (*rr*) chaff appeared to differ by a single factor, and waxy and waxless differed by a single factor showing normal segregation in the F_1 . Waxless appeared only in plants with less than 35 chromosomes, i. e., turgidum-like plants. Both parents were fairly resistant to *Puccinia glumarum*, although susceptible forms were found in F_1 . This seemed probably due to a single factor derived from *T. turgidum* and showing normal segregation in F_1 , but only expressing itself in plants with more than 35 chromosomes—vulgare-like plants. A provisional factorial scheme is suggested to express the composition of the parent species.

Inheritance of chemical characters in maize. E. W. LINDSTROM and F. GERHARDT (*Iowa State Col. Jour. Sci.*, 2 (1927), No. 1, pp. 9-18).—Supplementing studies noted earlier (E. S. R., 56, p. 519), chemical analyses were made at the Iowa Experiment Station on kernels from the P , F_1 , F_2 , and backcross generations of crosses between Evergreen Sweet and Illinois High Fat (white dent) corn.

The carbohydrate characters, i. e., total sugars, dextrin, and starch, in which the parental varieties differed markedly appeared to have a constant interrelationship. A balanced proportion of these endosperm constituents was maintained throughout the several hybrid generations, indicating that this interrelationship was determined by the simple, monohybrid, Mendelian mechanism (starchy-sugary genes). A cumulative effect of the endosperm genes was demonstrated quantitatively. The recovered sweet corn in F_1 or backcross generations had as high a carbohydrate index (water-soluble: water-insoluble carbohydrates) and sugar and dextrin percentages as did the original parental sweet corn.

Although the parental dent variety contributed the higher fat percentage, a distinct reversal of fat values was noted in the F_2 and backcross generations in which the sweet corn segregates consistently possessed the higher fat value with a fat percentage higher in all cases than the higher parental strain. Only small differences were observed in the nitrogen in the parental and later generations. The sweet corn segregates both in the F_2 and backcross generations tended to retain the higher nitrogen content, although the differences between starchy and sugary kernels in their nitrogen content were less than the parental difference. Nitrogen formation was to some extent independent of the major carbohydrate relations, and indications were that pentose content, while closely associated with the other carbohydrates, is also somewhat independent of their distribution and their heredity. Ash content seemed to be closely associated with the carbohydrate segregation, due probably to the chemical nature of the seed tissue and not directly to any genetic determination of simple genes for ash development.

Inheritance studies in soybeans.—III, Seed-coat color and summary of all other Mendelian characters thus far reported, F. V. OWEN (*Genetics*, 13 (1928), No. 1, pp. 50-79, fig. 1).—The third of this series (E. S. R., 58, p. 219), contributed from the Wisconsin Experiment Station, deals with seed coat color in the soy bean. Five linkages are postulated, and all genetic factors studied in soy beans are listed.

Black seed coat has been dominant to brown in all the crosses, although the dominance was incomplete in one cross. The results also indicated that different factors may produce black pigment. A genetic interpretation is given

to account for the presence of R_1 and R_2 , each of which is capable of producing anthocyanin pigment in the seed coat. While in one cross the factor W for purple flowers was found to be a complement of r , for the production of black pigment in the seed coat, in all other cases purple flower color was independent of other characters. Three restriction factors described are dominant, but their expression is quite sensitive to conditions under which the plant is grown. The factor T for tawny pubescence proved to be very important in increasing the intensity of pigment, perhaps because of an actual increase in the amount of pigment. T was completely linked to R_2 . In black podded varieties a certain amount of the brownish-black oxidation pigment of the pod was sometimes evident in the seed coat.

A factorial analysis of certain shape characters in squash fruits, E. W. SINNOTT (*Amer. Nat.*, 61 (1927), No. 675, pp. 333-344, figs. 4).—The results of hybridization studies at the Connecticut Agricultural College with homozygous inbred lines of summer squash suggest that fruit shape in the squash is controlled by definite genetic factors for shape inherited in typical Mendelian fashion rather than by factors which control growth in any given dimensions. Shape factors are believed to be numerous and to occur perhaps one or more in each of the chromosomes.

The genetics of plumage color in poultry, C. W. KNOX (*Iowa Sta. Research Bul.* 105 (1927), pp. 105-131).—In studying the inheritance of plumage color in poultry, reciprocal crosses were made between breeds as follows: White Plymouth Rock \times Black Langshan, White Plymouth Rock \times Buff Orpington, and Black Langshan \times Buff Orpington.

The results in the F_1 , F_2 , and back-cross generations indicated that the factor for color, C , behaved as a simple Mendelian dominant, as did the factor for the extension of black pigment, E , and the sex-linked factor for barring, B .

The inheritance of buff was not so simple, but the hypothesis fitting the data most closely was one in which there were two pairs of factors, Bu and Bu' , for buff. The expression of these factors was related to the balance between C and E . If both C and E were heterozygous with two doses of the buff factors the color was buff, but if either C or E was homozygous dominant and the other heterozygous the color was black, unless three or more doses of the buff factors were present, when they proved to be epistatic to black.

It is concluded that the formulas for the males of the breeds used and the characters studied are as follows: White Plymouth Rock $EE BB bu bu bu' bu' co$; Black Langshan $EE bb bu bu bu' bu' CO$; and Buff Orpington $ee bb Bu Bu Bu' Bu' CO$. The females of each breed differ only in having but a single dose of the barring factor.

The inheritance and transmission of the characters "capacity for fat production," C. W. TURNER and W. GIFFORD (*Missouri Sta. Bul.* 256 (1927), pp. 67, 68).—In a study of the average contribution of Jersey and Holstein dams above the potential transmitting ability of the sires, based on the records of all sires of the two breeds having ten or more daughters with available records, a theory of the mode of inheritance has been advanced that "milk and fat secretion of the dairy cow is influenced by many genes; that many of the genes favoring high production are dominants; and that all genes do not have the same effect."

✓ **Calculating linkage intensities by product moment correlation, F. V. OWEN** (*Genetics*, 13 (1928), No. 1, pp. 80-110).—A method suggested in this contribution from the Maine Experiment Station for calculating linkage intensities by means of a product moment coefficient of correlation r is recommended as a general method in preference to other methods compared therewith.

Yule's coefficient of association Q appeared a valuable supplement to the coefficient of correlation, and when differential mortality of zygotes is known it gives a better approximation to the true crossing-over percentage. Fisher's method, while very convenient, is limited in use to distributions where observed ratios closely approach the theoretical ratios. Much value is attached to the coefficient of correlation because it may be readily applied to complex relationships as well as to simple cases of backcrossing.

Studies in human inheritance.—The linkage relations of the blood groups, L. H. SNYDER (*Ztschr. Immunitätsf. u. Expt. Ther.*, 49 (1926), No. 5, pp. 464-480, fig. 1).—All possible matings between representatives of the four different blood groups have been worked out theoretically to show the various types of offspring to be expected with and without linkage between the blood group and some other specific characteristic.

Sex determination in hemp (*Cannabis sativa* L.), K. HIRATA (*Jour. Genetics*, 19 (1927), No. 1, pp. 65-79).—Further studies concerned with sex in hemp (*E. S. R.*, 54, p. 527) are reported to have given results agreeing in a measure with those of McPhee (*E. S. R.*, 54, p. 728).

Every individual from the selfing of female intersexes except a very few males appeared to be female or female intersex. The F_1 results from mutual crossing of female intersexes gave indications that the same individual shows different sexual expressions according to the period of flowering, a fundamental piece of evidence that sexual expression in hemp is comparatively easily affected by different physiological conditions. It was also evident that the offspring from the various crossings of the male intersexes can show various sex forms.

The mechanism of development of sex characters: Analysis of the phenomena of hermaphroditism [trans. title], M. M. ZAVADOVSKIĖ (ZAWADOWSKY) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka* (Trans. Lab. Expt. Biol. Zoopark, Moscow), 2 (1926), No. 2, pp. 29-83, figs. 26; Ger. abs., pp. 63-83).—Studies of the variations in the effects of castration followed by gonad transplantation and regeneration indicated that there are three types of secondary sex characters, designated as pseudosexual, eusexual, and somosexual.

The pseudosexual characters are differentiated in the two sexes, but the development is not influenced by the sex hormone.

The development of eusexual characters depends upon the presence of the hormone in the blood. It was found that after castration this hormone disappeared from the blood within 24 hours. The degree of development of characters of this type depends upon the amount of the hormone present.

Somosexual characters are without influence of the hormones in development. They are present only in conjunction with male or female hormones and are unlike pseudosexual characters, which are potentially present in both sexes.

Tissue inertia and variations in the amount of hormone present and manner of reaction of different characters are suggested as explanations of hermaphroditism.

Bisexual nature of the hen and experimental hermaphroditism in hens [trans. title], M. M. ZAVADOVSKIĖ (ZAWADOWSKY) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka* (Trans. Lab. Expt. Biol. Zoopark, Moscow), 2 (1926), No. 2, pp. 121-179, pl. 1, figs. 33; Eng. abs., pp. 164-179).—As evidence of the bisexual nature of the hen, the author describes experiments in which the left ovary was removed and the birds developed testicular tissue from the rudimentary right gonad. This change was also associated with the development of male secondary sex characters.

The development of an ovary successfully implanted into a castrated hen showed the presence of seminiferous tubules, demonstrating the bisexual nature of the left ovary.

Experiments in which regenerating ovaries and testicular grafts were developing simultaneously in the same bird indicated that there is no antagonism between the development of these two structures, but that the female characteristics predominate in birds in which there is a full development of the ovary irrespective of whether or not there be normal testicular tissue present.

A reversible dependent sexual character in male guinea pigs [trans. title], M. A. VORONTOVA (VORONZOWA) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka* (Trans. Lab. Expt. Biol. Zoopark, Moscow), 2 (1926), No. 2, pp. 99-120, figs. 19; Eng. abs., pp. 119, 120).—The effect of castration on size and structure of the horny styles of the penis of 30 guinea pigs was studied by comparison with the normal styles from 155 animals. Castration reduced the size and, if performed during the first week after birth, entirely prevented the development of this organ. Removed horny styles regenerated in complete males but did not regenerate in castrated animals.

Equipotentialities of male and female pheasants concerning the red area about the eyes [trans. title], M. M. ZAVADOVSKIĬ (ZAWADOWSKY) and N. I. KRICH (N. J. KRITSCH) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka* (Trans. Lab. Expt. Biol. Zoopark, Moscow), 2 (1926), No. 2, pp. 251-259, figs. 7; Ger. abs., p. 259).—The sex differences in this characteristic, together with the effect of castration, are described.

Does the age dimorphism in birds depend upon the sex glands? [trans. title], M. M. ZAVADOVSKIĬ (ZAWADOWSKY) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka* (Trans. Lab. Expt. Biol. Zoopark, Moscow), 2 (1926), No. 2, pp. 9-28, figs. 16; Ger. abs., pp. 22-28).—Studies of the effect on feather characteristics of the castration of male and female fowls, pheasants, and ducks indicated that the immature feathering was independent of the secretion of the sex glands, but that the female type of feathering in mature birds was in no sense a result of the same conditions, though the two types resembled each other. The latter type was influenced by hormones secreted from the ovary.

FIELD CROPS

[Agronomic studies in Alabama], M. J. FUNCHESS and H. B. TISDALE (*Alabama Sta. Rpt. 1924*, pp. 5-7).—Rotation experiments demonstrated the decline in cotton or corn yields on land continuously planted to corn and cotton and the maintenance of cotton yields on land in a 2 or 3 year rotation that includes legumes. In a 3-year rotation including several legume crops turned under for the major crops, cotton, corn, and oats, rock phosphate gave about as effective results as acid phosphate for corn and oats but not as good for cotton. However, it appeared that rock phosphate may be used to advantage provided a good cropping system is followed. Results showed that much of the nitrogen needed by cotton, corn, and oats could be supplied by introducing legumes into the rotation.

Other tests reported on included comparisons of acid phosphate v. rock phosphate for cotton, corn v. sorghum for silage, and fall v. spring planted oats, subsolling trials with cotton, corn, and peas, a spacing test with peanuts, yield tests with kudzu for hay, and varietal trials with oats, wheat, and rye.

[Field crops work at the Alaska Stations], C. C. GEORGESON (*Alaska Stas. Rpt. 1926*, pp. 6-8, 12-18, 20-26, figs. 3).—Varietal trials with wheat, barley, oats, field peas, vetch, and potatoes and production tests with Jerusalem arti-

chokes, sugar beets, and other root crops, sunflowers, and hay are reported on as heretofore (E. S. R., 57, p. 522). The merits of wheat, barley, and oats hybrids and potato seedlings are noted briefly. Sugar beets had fairly satisfactory sugar content, 16.1 to 17.9 per cent, although the roots were small in size and tonnage was not high. Sugar beets of more rapid growth and earlier maturity than varieties now available appear necessary for successful sugar beet culture in Alaska.

[Agronomic work in Delaware], G. L. SCHUSTER and C. R. RUNK (*Delaware Sta. Bul. 152* (1927), pp. 7-9).—The best pasture mixtures included redtop 4 lbs., meadow fescue 2 lbs., white Dutch clover 2 lbs., and alsike clover 2 lbs., and also the further inclusion of brome grass 2 lbs. and Japan clover 10 lbs. per acre. Application of 10 tons of manure per acre has resulted in the highest green weight of grass and was followed by a mixture of acid phosphate 160 lbs. and potassium chloride 50 lbs. Lime was also beneficial. Tests in southern Delaware proved that Dallis and Vasey grasses could not endure the winter, while meadow fescue and brome grass were promising for use in mixtures on the sandy soils. Domestic, including Canadian, red clover seed seemed more desirable than foreign seed. Three cuttings of alfalfa for hay were evidently more profitable than either two or four. The grain yields of 12 wheat varieties in three localities are tabulated.

[Field crops investigations in Missouri, 1926-27], W. C. ETHERIDGE, L. J. STADLER, R. T. KIRKPATRICK, B. M. KING, T. J. TALBERT, and J. T. QUINN (*Missouri Sta. Bul. 256* (1927), pp. 69-74, 76-78).—Breeding work with wheat, oats, and corn, varietal trials with soy beans, oats, wheat, cotton, and potatoes, comparisons of grain sorghums with corn for grain and forage production, and fertilizer and planting tests with cotton and potatoes are again reported on (E. S. R., 57, p. 424).

More elaborate studies of crossing-over in the *C-Sh-Wx* region in corn showed that the effects of specific treatments on crossing-over may be measured accurately by comparing the crossover percentage in treated and untreated tassels of the same plant. A range of variation of about 50 per cent in crossover frequency in different families was found, the variation being somewhat greater in the *C-Sh* region than in the *Sh-Wx* region, and the family differences were very consistent. In general, families with a high frequency of crossovers in female gametes were high in crossover frequency in male gametes also. Studies of the effect of various environmental factors, particularly X-rays and radium radiation, on the frequency of gene and chromosome mutation are discussed briefly.

Applied to cotton on rich, heavy lowland soils, neither 300 lbs. of acid phosphate, alone, nor with 50 lbs. of sodium nitrate, nor with the sodium nitrate and 30 lbs. of potassium chloride gave significant increases over untreated plats. Small increases were made on lighter, less fertile soils with these treatments although sodium nitrate or potassium chloride alone failed to increase yields. Two to four plants per hill in hills 10 to 12 in. apart gave the best yields of seed cotton.

Northern grown certified seed potatoes continued to give more satisfactory results than home grown or northern grown uncertified seed. Irish Cobbler and Early Ohio varieties planted March 25 yielded more than earlier or later plantings. A 3-12-4 (N-P-K) fertilizer at the rate of 400 lbs. per acre plus 8 tons of barnyard manure produced the highest yield, and a 500-lb. rate of application for fertilizers gave the most economical returns.

Scab and Rhizoctonia were controlled by the hot formaldehyde treatment and also by corrosive sublimate and by Semesan. Neither Bordeaux mixture prepared by several different methods nor arsenate of lead spray appeared to

burn potato plants. It seemed that under Missouri conditions the method of mixing Bordeaux spray will not greatly affect its stimulating or insecticidal value.

[Agronomic work in the Philippine Islands], S. YOUNGBERG (*Philippine Bur. Agr. Ann. Rpt.*, 26 (1926), pp. 23-30, pls. 2).—These pages report the further progress of experiments (E. S. R., 57, p. 425) with corn, rice, sugar cane, tobacco, abaca, kapok, and miscellaneous cereal, forage, and fiber crops.

The Pampa: A natural or culturally induced grass-land? O. SCHMIEDER (*Calif. Univ. Pubs. Geogr.*, 2 (1927), No. 8, pp. 255-270, pl. 1, figs. 2).—Consideration of historical accounts and environmental observations led to the conclusion that the Spaniards found the Argentine plains covered in the west by a climax formation, the monte, whereas the eastern plains, the Pampa proper, probably represented at that time a cultural landscape, bearing the signs of an intensive transformation originated by the pre-Columbian population.

The manuring of grassland (*Rothamsted Expt. Sta., Harpenden, Rpt. 1925-1926*, pp. 24, 25).—In experiments on the fertilizing of grassland at Rothamsted and elsewhere basic slags of different solubility were compared on new seedlings, old hay, and grazing land, sheep being used for grazing.

Solubility seemed a fairly good criterion of effectiveness, the highly soluble slag surpassing the medium, which was better than the low soluble. The amount of phosphate present was apparently not the only difference. The low soluble slag seemed to have a distinct value in moist conditions but not in drier districts. Comparison of Rothamsted results with those obtained elsewhere showed that grassland is not readily improved by slag if an acre of it yields about 200 lbs. live weight increase in sheep. The striking results are had on land giving only 50 or less pounds increase per acre.

The grazing experiments appeared rather difficult to carry out, and new methods could not be used because of the great difficulty of providing the adequate number of replicate plats. The liability to error is increased by the irregularities of the pasture, the inequalities among the sheep, and the fact that the land must be very closely grazed or the herbage becomes too coarse to nourish the sheep. This close grazing is very important; at one center the sheep did worse on the slagged land than on the unmanured simply because the grass grew too much for them. Consequently the grazing results are not as sharply defined as those on arable or hay land, where the errors are much smaller.

Freaks in wheat and rye, J. B. HARRINGTON (*Sci. Agr.*, 8 (1927), No. 3, pp. 190-192, figs. 2).—Distortion of spikes found in varieties pertaining to seven species of wheat and in Dakold rye grown in poorly drained plats at the Saskatoon, Saskatchewan, experimental farm appeared to be the direct result of unfavorable environmental conditions and not hereditary in nature.

Medicago sativa and its races [trans. title], L. P. BORDAKOV (BORDAKOW) (*Selsk. Khoz. Opytn. Delo (Landw. Versuchsw.)*, No. 12 (1927), pp. 65-77, figs. 9; *Ger. abs.*, pp. 76, 77).—Observations on 663 sorts of alfalfa from many sources permitted the principal groups to be distinguished by differences in leaf form and color, plant type, stem color, and growth after cutting.

Alfalfa production in Kansas, R. I. THROCKMORTON and S. C. SALMON (*Kansas Sta. Bul.* 242 (1927), pp. 42, figs. 12).—Production practices outlined for growing and handling alfalfa for hay and seed in Kansas are based extensively on experiments at the station (E. S. R., 46, p. 30; 53, p. 531). Information is also included on the effects of alfalfa on other crops and soil fertility, seed production, and on the control of diseases, insect pests, and pocket gophers.

Why alfalfa fails, F. M. ROLFS (*Oklahoma Sta. Circ.* 64 (1927), pp. 4).—Killing out of alfalfa is said to be due to a combination of soil and weather

conditions, supplemented more or less by animals, insects, and plant parasites. Replacing the alfalfa with cereals or other fibrous rooted crops for about 3 years is suggested as a means of practically ridding alfalfa of the parasites and materially increasing the yield. Six years seems about the present limit for profitable alfalfa production.

Test garden studies with 109 sorts of beets [trans. title], J. J. BOLSUNOW and N. J. OBLOWSKY (*Ztschr. Pflanzenzücht.*, 12 (1927), No. 4, pp. 305-325, fig. 1).—Observations made at Kiev, Ukraine, are recorded on the general group behavior and on the shape, dimensions, color, weight, and sugar content of the roots of 109 samples (72 from Europe and America and 37 of Asiatic origin) of sugar beets, half-sugar beets, table beets, mangels, and fodder beets.

Red clover investigations, R. D. WILLIAMS (*Welsh Plant Breeding Sta., Aberystwyth. [Bul.], Ser. II, No. 7 (1919-1926), pp. 136, pls. 11, figs. 7; Swed. abs., pp. 126-132*).—Studies concerned with the morphological and physiological characteristics of most of the varieties and nationalities of red clover generally grown in the country are described in detail, and a comparison of the productiveness of the different sorts of red clover under hay and pasture conditions is reported on. Related problems dealt with included the relation between the yields of hay and aftermath, competitive effect of the several varieties on grasses and weeds, lodging, occurrence of local strains in different varieties, genuineness and purity of the British varieties, and the relative resistance of different varieties to clover sickness, anthracnose, and leaf spot disease.

Hard seeds and broken seedlings in red clover (*Trifolium pratense*).—III, **Soil effects**, A. NELSON (*Bot. Soc. Edinb. Trans. and Proc.*, 29 (1926-27), pt. 4, pp. 402-407, pl. 1, fig. 1).—In further tests (E. S. R., 56, p. 826), two samples of red clover seed sown in soil yielded fewer normal plantlets than when germinated on such an artificial medium as blotting paper, and produced a number of broken seedlings strictly comparable with that found in the artificial test. A high proportion of the broken seedlings resulted in functioning plants. The observations suggested that if the plumular bud is accompanied by any sensible amount of the other portions of the developing embryo a functioning plant results.

✓ **"Hernious" seeds in maize**, T. V. ZAPPAROLI (*Jour. Heredity*, 18 (1927), No. 10, pp. 461, 462, fig. 1).—"Hernious" seeds observed in corn at the Experimental Station for Corn Culture, Bergamo, Italy, are characterized by a protuberance at the scar of the style, which might be called an extroflexion of the endosperm. Hard and vitreous hernias remain firm even after drying, whereas the mealy type detach easily on drying. The character is variable in size, usually spherical, and is thought to be heritable.

The effect of carbon bisulphide on the germination of maize, A. R. SAUNDERS and R. O. WAHL (*Union So. Africa Dept. Agr. Bul.* 28 (1927), pp. 4, fig. 1).—Corn containing 12.3 per cent of moisture and treated with carbon disulfide at the rate of 9 lbs. per 1,000 cu. ft. was stored as long as 3.5 months in hermetically sealed containers without injury to germination. Storage could be endured for 6 months if but half the chemical was used. It is stated that corn with a higher moisture content will suffer greater injury under these conditions.

Factors affecting the popping quality of pop corn, J. G. WILLIER and A. M. BRUNSON (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 7, pp. 615-624, figs. 2).—This contribution is concerned chiefly with a study of the degree of association between certain morphological kernel characters of pop corn and popping yield.

Molsture and popping determinations made on White Rice pop corn through a molsture range of from 17 to 6.3 per cent showed about 12 per cent to be the optimum molsture content for greatest expansion in the sample. In a lot of White Rice pop corn a distinct tendency was observed for the size of kernels to decrease with increase in expansion. Similarly, decrease in the percentage of soft starch accompanied increase in expansion. Correlations obtained in an extensive study with Yellow Pearl pop corn involving seven characters confirmed the foregoing observations and suggested that the relationships noted are of a general nature and not limited to the varieties studied. Study of the kernel characters should be a valuable aid in selecting seed to maintain and improve the popping quality of a strain of pop corn, although it can not wholly supplant an actual popping test of individual ears.

✓ **Defruiting as an aid in cotton breeding**, F. M. EATON (*Jour. Heredity*, 18 (1927), No. 10, pp. 456-460, fig. 1).—Experiments at Sacaton, Ariz., showed that if all of the bolls are removed from cotton plants more flowers may subsequently appear on these plants than on control plants, and that a larger percentage of the flowers on the previously defruited plants develop into mature bolls than on untreated plants. With the removal of the previously set fruit the products of photosynthesis, which prior to defruiting were translocated to the developing fruit, are turned to new growth and flower production with a concurrent decrease in the number of floral buds which otherwise would have been shed. Application of the relationship appearing in these results may enable the breeder to avoid losses of effort caused by shedding of selfed or cross-pollinated flowers.

✓ **Acala cotton, a superior upland variety from southern Mexico**, O. F. COOK and C. B. DOYLE (*U. S. Dept. Agr. Circ.* 2 (1927), pp. 30, pls. 11, fig. 1) — Information is given on the origin, status, characteristics, adaptation, and cultural and marketing advantages of Acala cotton. The production status of the variety in California, Arizona, Texas, and New Mexico is outlined, and comment is made on the supply and production of Acala seed, type and variations, and ginning precautions.

Crotalaria as a soil-building crop, W. E. STOKES (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 10, pp. 944-948).—The characteristics of *C. striata* and its cultural and environmental requirements, composition, comparative yields, and value for soil improvement are described from tests at the Florida Experiment Station. It grows on poor, thin, sandy land, seeds freely and reseeds well, smothers out undesirable plants, seems practically free from serious insects and diseases, and returns to the soil plenty of vegetable matter rich in nitrogen.

✓ **The relation between sex and seed characters in hemp** [trans. title], M. KONDO and T. OKAMURA (*Nōgaku Kwaihō (Jour. Sci. Agr. Soc. [Japan])*, No. 283 (1926), pp. 233-257; *abs. in Japan. Jour. Bot.*, 3 (1927), No. 3, p. (56)).—The length, breadth, thickness, and form coefficient (length: breadth \times 100) were found similar in seed giving rise to male or female plants. On the average, male seed appeared slightly thicker than female seed, while the female seed had a slightly greater specific weight. From seed with specific weight from 0.86 to 0.92 came proportionately more male plants. The seed characters mentioned were not accurate criteria of the sex of the seed.

✓ **Temperature and other factors affecting the rest period of potato tubers**, W. E. LOOMIS (*Plant Physiol.*, 2 (1927), No. 3, pp. 287-302, figs. 4).—Experiments at the University of Arkansas (E. S. R., 58, p. 321) showed that the rest period of dormant potato tubers was broken in 4 weeks by storage during July in a low-roofed building. The efficacy of storage temperatures around 30° C. (86° F.) in shortening the dormant period of potato tubers and the

importance of high soil temperatures for the rapid germination of partially dormant tubers were also demonstrated. Storage at high temperatures in damp moss, as compared with dry storage, reduced shriveling and rot loss following planting, presumably because of the more rapid formation of a wound periderm in the turgid tubers, but did not affect the rest period directly.

Selected from a lot of freshly dug potatoes, 3- and 4-oz. tubers germinated more readily and made a stronger growth than 1- and 2-oz. tubers, although the difference was lost as the tubers passed through the rest period. Composted soils and low concentrations of nitrogenous fertilizers seemed to stimulate the germination of dormant and partially dormant tubers, but this was not observed in tubers completely out of the rest period.

Michigan certified seed potatoes show quality, H. C. MOORE (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 55-57, figs. 2).—The 1927 crop of Michigan certified seed potatoes was about 227,000 bu., grown on 1,623 acres, and 83 per cent belonging to Russet Rural or Late Petoskey. Michigan certified seed in 1,300 tests outyielded ordinary seed by an average of 48 bu. per acre, and the market quality of the crop from the certified seed was 20 per cent better than that from the noncertified seed.

Rhodes grass [trans. title] (*Colombia Min. Indus., Secc. Pubs., Bol. Propag. Agr.*, No. 2 [1927], pp. 12, figs. 5).—Practices are outlined for the culture of Rhodes grass in Colombia.

✓ Studies in wild rice, *Oryza sativa* Linn., R. J. D. GRAHAM (*Bot. Soc. Edinb. Trans. and Proc.*, 29 (1926-27), pt. 4, pp. 349-351).—Comparative germination studies demonstrated that wild and cultivated forms of rice differ significantly in the amount of water taken up during germination, the percentage being greater in cultivated forms. The delayed germination in wild rice appeared to be due to a limited oxygen supply reaching the embryo until the pericarp is ruptured artificially by scratching or naturally by drying, rather than to the smaller water intake or anatomical difference in the pericarp over the embryo.

✓ Rye production in Saskatchewan, M. CHAMPLIN (*Saskatchewan Univ., Col. Agr. Ext. Bul.* 35 (1927), pp. 20, figs. 5).—Practices are outlined for growing rye in the province as the result of experience and experiments at the University of Saskatchewan.

✓ Inheritance of bolting in sugarbeet, J. P. D. VAN HEEL (*Genetica [The Hague]*, 9 (1927), No. 3, pp. 217-236, figs. 9).—Strains of sugar beets inbred by an isolation method generally yielded less than open pollinated commercial seed, although evidently not because of degeneration. The yield reduction was accompanied by the separation of subvarieties differing in morphological characters and gradually becoming uniform and constant. In certain strains there were high percentages of bolters, i. e., plants producing seed stalks the first year. Crosses between strains with few bolters and with many indicated that the factors for bolting are recessive.

The losses of sugar in the storage of sugar beets [trans. title], I. I. DOKHLENKO (*Zapiski*, 4 (1926), No. 3, pp. 77-86).—The investigation reported dealt with the control of the losses of sugar in sugar beets in storage, the loss in weight, the change in composition of nitrogen compounds, and other aspects of the storage problem.

The results led to recommendations that areas infested with disease should be isolated and infected beets be destroyed to control the disease. A clean cut at the crown perpendicular to the axis will permit examination for diseases. Infested fields should be plowed and seeded to some grain crop, and all litter in connection with the storage should be burned. It appeared advisable to determine the maturity of the beets before digging and to keep unripe beets

separate. Sprinkling the pits with iron sulfate before storage of beets and maintaining a constant storage temperature are also suggested.

✓ **Length of life of seed-piece roots of sugar cane and progress of the roots in the soil at different ages of growth**, H. A. LEE and D. M. WELLES (*Plant Physiol.*, 2 (1927), No. 3, pp. 337-347, figs. 4).—Continued investigations (E. S. R., 57, p. 432) at the Hawaiian Sugar Planters' Experiment Station gave indications that, based on root weights, a normal sugar-cane plant obtains its nutrients during the first month of growth from the seed piece and through the seed piece from the seed-piece roots. At the end of 1 month seed-piece roots averaged 97.3 per cent of the total roots of the plant and roots from the new aerial shoot or stalk only 2.7 per cent. The respective percentages at the end of the second month were 22.7 and 77.3, and at the end of the third month 1.2 and 98.8. After this period the seed-piece roots continued to reduce in weight and constituted a negligible proportion of the total roots.

The quantity of roots in the upper levels of soil was found to increase with the age of the plants. Although the uppermost roots in the first month of growth made up about 85 per cent of the total roots, the percentage gradually decreased during the second month until only from 50 to 75 per cent of the roots were present in the topmost 8 in. of soil. From then on the proportion of roots in the topmost levels of soil became more or less constant. Application of the results to practice is suggested.

[Influence of the preceding crop on tobacco in Java], A. N. J. BEETS (*Proefsta. Varatenland, Tabak [Dutch East Indies], Meded.* 58 (1927), pp. 119, figs. 6; *Eng. abs.*, pp. 117-119).—When native tobacco, peanuts, or red peppers had preceded tobacco a considerable reduction occurred in the tobacco stand, probably because of diseases and insects, and especially when these crops had been grown for two or more years. When corn or soy beans had preceded tobacco for one or more years such effects were not apparent.

Critical review of the Ukrainian Trifolium species of the ochroleuca group [trans. title], O. SOKOLOVSKIĬ (A. SOKOLOWSKY) (*Izv. Kievsk. Bot. Sada [Bul. Jard. Bot. Kieff]*, No. 5-6 (1927), pp. 93-103; *Ger. abs.*, pp. 102, 103).—The characteristics of *T. pannonicum* and *T. ochroleucum* and their distribution in Ukraine are indicated, with notes on *T. squarrosum*.

Protein and test weight of the 1927 North Dakota wheat crop, C. E. MANGELS, T. E. STOA, and R. C. DYNES (*North Dakota Sta. Bul.* 213 (1927), pp. 16, figs. 5).—A survey of the 1927 wheat crop similar to those noted earlier (E. S. R., 58, p. 34) showed common wheat to average 57.7 lbs. per bushel and 11.82 per cent of protein (651 samples) and durum wheat 60.1 lbs. per bushel and 11.21 per cent (203 samples). The relative influences of weather, region, date of seeding, and variety on the protein content of wheat are commented on.

Determination of the origin of crop seeds [trans. title], I. FRANÇOIS (*Ann. Sci. Agron. Franc. et Étrang.*, [44] (1927), No. 1, pp. 45-70, figs. 4).—To facilitate the determination of the origin of lots of clover and alfalfa seed, the author has indicated the distribution in France of *Scabiosa maritima*, *Centaurea melitensis*, *C. aspera*, *Galega officinalis*, *Sorghum halepense*, and *Salvia verbenaca*. See also previous notes (E. S. R., 52, p. 733; 55, p. 534).

Agricultural seed, W. BROUWER (*Landwirtschaftliche Samenkunde. Neudamm: J. Neumann, 1927, pp. 130, pls. 14, figs. 2*).—Described as a key for the determination of the smallkerneled crop seed and important weed seeds, this manual groups the various species according to morphological characters.

Experiments with sodium chlorate and other chemicals as herbicides for field bindweed, W. L. LATSHAW and J. W. ZAHNLEY (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 8, pp. 757-767, figs. 2).—Spraying tests at the Kansas Experiment Station involving fallow, sodium chlorate, sodium arsenite, sodium

hypochlorite, zinc chloride, copper sulfate, and K. M. G. weed killer showed solutions of sodium chlorate to be the only treatment effective in decreasing the number of field bindweeds (*Convolvulus arvensis*). The optimum time for the first spray seemed about the full bloom stage, and a 12.5 per cent solution of sodium chlorate appeared as effective as a 25 per cent solution. No permanent detrimental effect on the soil from any of the chemicals used was observed.

Microscopic studies were made of the roots and food reserves. Observations indicated that sodium chlorate interferes with photosynthesis and compels the plant to draw upon the food reserve in the roots until the supply is exhausted and death occurs.

Canada thistle, *Cirsium arvense* Tourn., field thistle, creeping thistle, F. DETMEERS (*Ohio Sta. Bul.* 414 (1927), pp. 45, figs. 13).—This report of the progress of a detailed study of Canada thistle gives information on its nomenclature, life history, characteristics, means of propagation and dissemination, natural enemies, and methods for its control and eradication.

Neither of the most prevalent fungi, *Septoria cirsii*, which causes spots on the leaves, and *Puccinia suaveolens*, a rust attacking the stem and leaves, seriously injures the host. Insects found infesting Canada thistles in Ohio included *Pyrausta* (*Vanessa*) *cardui* L., the Painted Lady butterfly, which defoliates the plants; *Dasyneura gibsoni* Felt, a midge fly which infests young flower heads and prevents seed development; *Trypeta florescentiae* L., a dipterous fly which eats the developing and fully developed seeds; a stem girdler, *Crampus* sp.; and two species of aphids.

Extensive experiments and experience led to the conclusion that Canada thistles can be controlled by keeping down the aerial shoots, thereby preventing seeding and the accumulation of food in the roots. Control measures include mowing, salting and cropping, cultivation, and spraying with chemicals that kill only the aerial parts. The best eradication method was found to be clean cultivation and the use of alfalfa or sweet clover as a smother crop. None of the chemicals tested as herbicides were found profitable on large areas unless other control methods were not feasible.

HORTICULTURE

[**Horticultural investigations at the Alabama Station**] (*Alabama Sta. Rpt.* 1924, pp. 12, 16–18).—Studies by W. A. Gardner of the activities of various gases in the coloring of Satsuma oranges suggested that acetylene as well as ethylene may be substituted for the exhaust gases of engines. Nitrogen and carbon dioxide were entirely ineffective.

Descriptions are given by C. L. Isbell of the tree and fruit of 14 varieties of apples, and data are presented on the comparative performance of pecan varieties. Isbell reports in detail upon the results of a study of fruit bud formation and associated growth in the pecan. Pistillate blooms were apparently formed in late winter or early spring, corroborating the finding of the Woodroofs in Georgia (*E. S. R.*, 56, p. 142) and of Shubart in Oklahoma (*E. S. R.*, 57, p. 439). Catkins were formed in buds on primary or first growth shoots early in the growing season and in those on second growth shoots soon after they appeared. The apical and adjacent bud at any given node may both give rise to a fruiting shoot the same year. Varietal differences in growth habits are recorded.

[**Horticultural investigations at the Alaska Stations**], C. C. GEORGESEN (*Alaska Stas. Rpt.* 1926, pp. 2–6, 8–10, 19, 28, 29, figs. 2).—As for the preceding year (*E. S. R.*, 57, p. 532) breeding studies with the strawberry were con-

tinued with approximately 200 new seedlings fruiting for the first time. Currants, gooseberries, and raspberries again proved valuable, but blackberries failed. Of many apples tested Yellow Transparent alone proved worthy. Transcendent crabapple ripens its fruit in favorable years. The Early Richmond sour cherry when trained against a wall yielded regularly, but other cherries were unsuccessful. The Triumph peach when trained against a wall yielded some fruit. Vegetables almost without exception gave excellent results.

Experiments in the propagation and culture of the narcissus, tulip, English iris, and the gladiolus demonstrated that these plants may be successfully grown in southeastern Alaska. Various annual and perennial flowers gave satisfactory results.

At the Matanuska Station peonies, sweet Williams, and Chinese pinks wintered successfully, and vegetables, particularly of the quick-growing types, did well. Currants thrived without winter protection, but raspberries and gooseberries were sometimes injured. Strawberries when covered with snow wintered successfully without protection. Some of the station hybrids were particularly promising. Grown on northern slopes strawberries ripened considerably later and extended the season.

[Horticultural investigations at the Delaware Station] (*Delaware Sta. Bul. 152 (1927), pp. 30-40*).—Reporting further (E. S. R., 56, p. 341) on a Mendelian study with cabbage, L. R. Detjen and G. F. Gray present data on the inheritance and occurrence of various characters. An examination of the progeny of crosses between heading and nonheading types indicated that heading is dominant. The season of maturity of cabbages was apparently governed by a multiple factor, and the annual was found to be dominant over the biennial inflorescence. That full self-compatibility in the cabbage is attainable was indicated by two selfed plants which produced almost as much seed as crossed plants. An unexpected reversal from high self-incompatibility to moderate self-compatibility was observed in a pure line strain. A plant displaying cross-incompatibility with certain types was found highly compatible with others.

C. A. McCue and Detjen present a summary of the results of a long-continued study of the effects of potash, phosphoric acid, and nitrogen on apple production. A complete fertilizer was apparently essential to the maintenance of maximum growth and yield. Without fertilizer or cover crop, trees became dwarfed and unproductive. Gray, McCue, and Detjen found nitrogen to be an important nutrient for the peach. Studies by F. S. Lagassé upon carbohydrate-nitrogen relationships in the new growth of spurs of Jonathan trees receiving differential fertilizer treatments led to the conclusion that both total carbohydrate-total nitrogen and starch-total nitrogen relationships might be used in interpreting the response of apple trees to various conditions. Lagassé reports that the failure of Elberta buds to develop in 1926 was apparently not due to nutritional factors, as all trees, irrespective of fertilizer treatment, developed normally the succeeding spring. Attempts to propagate apples on their own roots by using very long scions were apparently partly successful, according to Lagassé, who reports 75.6, 83.3, 80.2, 85.9, and 88.3 per cent of living Stayman Winesap, Grimes, Delicious, Rome, and Yellow Transparent grafts, respectively, in July following planting. Stayman Winesap, Williams, and Yellow Transparent grafts planted in May, 1926, showed 24.4, 31.8, and 22.4 per cent living in July, 1927.

Two years' pollination studies with the Crimson Beauty apple led Lagassé to advise that this variety is not sufficiently self-fertile under Delaware conditions to warrant planting in large blocks. Yellow Transparent and Red Astrachan have proved satisfactory pollinizers for Crimson Beauty. Nyack was

also found practically self-sterile. The J. H. Hale peach again proved highly self-sterile but capable of satisfactory pollination by Ray, Elberta, Belle of Georgia, and Hiley.

[Horticultural investigations at the Missouri Station] (*Missouri Sta. Bul.* 256 (1927), pp. 78-83, figs. 2).—Determinations by A. E. Murneek of the seasonal changes in carbohydrate and nitrogen distribution in the bearing spurs and shoots of the apple showed a high percentage but a relatively small amount of total nitrogen in the flowers. The percentage of nitrogen decreased rapidly soon after fruit setting, while the total quantity rapidly increased in the developing fruits. The vegetative organs displayed a reverse nitrogen distribution. Carbohydrate metabolism proceeded rapidly during the period of pollination and fertilization, with a marked reduction following setting.

As reported by J. T. Quinn, no difference was observed in cantaloupes of a single variety in relation to the source of the seed. Hale Best, Edward Perfecto, and Pollock 10-25 proved the best varieties for commercial culture. Clay pots and wooden bands were more satisfactory than paper bands for starting cantaloupes. Work in selecting and testing wilt-resistant tomatoes and yellows-resistant cabbages was continued by Quinn (*E. S. R.*, 57, p. 434). Liberal applications of fertilizer greatly increased the yield of onions.

A 5-year investigation by T. J. Talbert, H. D. Hooker, Quinn, and H. G. Swartwout showed that neither the boiled soap lubricating oil emulsion nor the Missouri cold mix lubricating oil emulsion was harmful as a dormant spray for deciduous trees when used at 2 per cent strength. Combined with Bordeaux mixture, effective control of peach leaf curl and San Jose scale was obtained with the emulsions. Missouri cold mix proved compatible with both lime sulfur and Bordeaux, but the boiled oil soap emulsion did not mix with lime sulfur. At proper strength the Missouri cold mix may be used with Bordeaux mixture and arsenate of lead or with lime sulfur and arsenate of lead as a summer spray for apples, except at the calyx spray. It was observed that the method of preparing Bordeaux mixture had no apparent influence on the degree of foliage and fruit burning.

Studies by Hooker and Swartwout showed three maxima and three minima for carbohydrates in the cherry, the greatest accumulation occurring in spurs and shoots of tilled trees at the time of fruit bud formation. Comparing tillage with cover crops and sod for the Montmorency cherry, it was found that tilled trees grew faster and came into profitable maturity several years earlier than sod trees. Applications of nitrogen to sod-grown trees stimulated growth, health, and yields,

Working under the project of Breeding Apples for Late Blooming Habit, Murneek secured some 150 seedlings in 1926. Ben Davis, Delicious, Grimes, Jonathan, King David, Rome, and Winesap were found either wholly or partially self-sterile. With most varieties the central flower of the cluster gave a higher percentage set than did lateral flowers. Winesap was the poorest pollen producer of all varieties tested. Montmorency, Early Richmond, and English Morello cherries were found partially self-sterile but interfertile. The percentage set in Montmorency was increased by pruning off the 1-year wood and thinning the flowers to one per spur.

Carbohydrate transformations in carrots during storage, H. HASSELBRING (*Plant Physiol.*, 2 (1927), No. 3, pp. 225-243).—In studies conducted by the U. S. Department of Agriculture carrots stored at a temperature of 39-40° F. for 22 weeks lost about 26 per cent, and those stored at 32-35° lost 7 per cent of their weights. The two principal changes in chemical composition were a conversion of sucrose into reducing sugar and a change of polysaccharides

to simple sugar. These changes were more rapid at the higher temperature and during the early part of the storage period. Flavor was correlated with sucrose content and therefore at its height immediately following harvesting.

Orcharding, V. R. GARDNER, F. C. BRADFORD, and H. D. HOOKER (*New York and London: McGraw-Hill Book Co., 1927, pp. XI+311, figs. 136*).—A popular discussion of the various phases of fruit growing and marketing from the viewpoint of the beginner, accompanied with enough of the underlying principles to acquaint the novice with the foundations upon which fruit growing rests.

Fruit forcing, O. MEEBMAN (*Fruchttreiberei. Berlin: Paul Parey, 1927, pp. 55, figs. 23*).—Popular information is given on the indoor forcing of the strawberry, peach, grape, cherry, and pineapple.

Fruit growing in the Empire—Standardisation of horticultural material, with special reference to root-stocks, R. G. HATTON (*[London]: Empire Marketing Bd., 1927, pp. [1]+19, figs. 6*).—Emphasis is placed on the great variability occurring in fruit trees propagated on seedling roots and upon the advantages accruing from the use of vegetatively propagated stocks, the development of which has been intensively studied at the East Malling Research Station (E. S. R., 57, p. 237).

Fruit growing in the Empire.—II, Effect of nutrition on fruit quality, B. T. P. BARKER (*[London]: Empire Marketing Bd., 1927, pp. [1]+11, figs. 6*).—Pointing out that many factors have a bearing on the keeping quality of apples, the author briefly reviews some of the results secured at the Long Ashton Research Station where it was found that soil nutrients and soil texture have a direct influence on the keeping quality of apples.

Orchard soil management studies, F. P. CULLINAN and C. E. BAKER (*Indiana Sta. Bul. 315 (1927), pp. 40, figs. 13*).—In presenting a final report (E. S. R., 38, p. 641) on a 15-year soil management study in a young Stayman Winesap, Grimes, and Jonathan orchard at Laurel, the authors again point out the superiority of tillage with cover crops. However, the total yield of trees in grass supplemented with heavy annual applications of straw as mulch was equal in the last 5-year period to that obtained from tilled cover cropped trees or cultivated trees which received mulch or nitrate. The root system of mulched trees was, however, extremely shallow, a large number of the roots actually growing on the soil surface.

The least growth and the lowest production was attained by trees growing in grass sod without mulch or fertilizer. Nitrate determinations of the soil in 1918 showed nitrates to be much lower under grass in early spring than under tillage or straw mulch. Trees in grass sod without straw mulch made the greatest response to applications of nitrogen, suggesting that a lack of nitrogen was likely the most important factor limiting growth and production. Trees which had been continuously mulched with straw or tilled and cover cropped showed no significant increase in total yield from nitrogen fertilizers applied during the last 5 years.

Marked differences were observed in the varietal response to nitrogen; for example, Grimes trees in cultivation or continuous straw mulch failed to make any apparent increased growth as measured by trunk girth following nitrogen applications. On the other hand, Stayman Winesap trees showed a definite response to nitrogen on all plots.

Relation of composition to growth and fruitfulness of young apple trees as affected by girdling, shading, and photoperiod, R. H. ROBERTS (*Plant Physiol., 2 (1927), No. 3, pp. 275-286, pls. 4, fig. 1*).—Studies at the Wisconsin Experiment Station of the effects of shading, girdling, and changing the length of day upon yearling Wealthy apple trees grafted on standard

seedling stocks showed no one environment to have a consistent effect upon the composition, growth characters, or fruitfulness. For example, the effect of girdling in checking growth and inducing blossom bud formation was neutralized by shading. Short day trees without nitrogen grew and blossomed like long day trees with nitrogen. Girdling and shading greatly reduced root development. The largest amount of growth, as measured by percentage gain in weight of tree, total length of shoots, and amount of new roots, was made by trees exposed to normal conditions. It is advised that the mathematical ratio between nitrogen and carbohydrates can only serve as an indication of relations and that the type of growth should be used as the basis of determining cultural treatments.

Root stock effect on colour and size of apples, W. S. ROGERS (*East Malling [Kent] Research Sta. Ann. Rpt., 13, pt. 2 (1927), pp. 16-32, pls. 4*).—Studies of fruits gathered from the apple stock trial plats at the East Malling Research Station showed that trees on very dwarfing stock (type IX) generally produced the highest colored and largest fruits. Low vigor was not always correlated with high color, for in one comparison the more, vigorous stock produced the higher colored apples. It was observed that apples change quite considerably in color following picking. The methods of technique employed in grading apples for color and size are given in detail.

The course of pollen tube growth in the apple, J. H. BEAUMONT (*Minn. Univ., Studies Biol. Sci., No. 6 (1927), pp. 373-399, pls. 2, figs. 2*).—A cytological study at the University of Minnesota upon the growth of the apple pollen tube from the pollen grain to the ovule.

Contrary to the results of Namikawa (*E. S. R., 53, p. 123*), no evidence was obtained to show that pollen tubes are able to grow along the outer epidermis of the style or that fertilization can be effected by pollinating styles the stigmas of which have been cut away. Pollen tubes invariably grew in the conductive tissue of the stigma and style and over the surface of the placentas to the micropyle when growth was limited to a single carpel. However, it was observed that the pollen tube was able to pass from one drupelike carpel into another through the medium of the central cavity and the incompletely closed sutures.

Experiments with double-worked pears on quince stocks, N. H. GRUBB (*East Malling [Kent] Research Sta. Ann. Rpt., 13, pt. 2 (1927), pp. 11-15*).—Recorded in terms of tree vigor as indicated by the length of annual growth, trunk gain, etc., the variety used as intermediate in top-worked apple trees had a distinct influence on the vigor of the top. However, vigor in the intermediate variety was not always correlated with vigor in the top. Preliminary observations on flowering indicated that the intermediate scion variety probably influences the age at which the tree begins to fruit.

Peach growing in Missouri, T. J. TALBERT and H. D. HOOKER (*Missouri Sta. Oiro. 164 (1927), pp. 23, figs. 11*).—General information is offered on sites, varieties, methods of planting, culture, pruning, protection from various pests, fruit thinning, harvesting, etc.

Varietal characteristics of plums in the Pacific States in relation to pruning, C. F. KINMAN (*U. S. Dept. Agr. Bul. 1477 (1927), pp. 38, pls. 39*).—A discussion of the growth and fruiting habits of a large number of plums as grown under the semiarid conditions of the irrigated sections of the West, with suggestions regarding pruning practices which lead to sustained production of the large-sized fruits needed for eastern shipment.

Observations on the water conductivity of the stems of reverted black currants, R. C. KNIGHT (*East Malling [Kent] Research Sta. Ann. Rpt., 13, pt. 2 (1927), pp. 70-72*).—No difference was recorded in the water conductivity of the stems of healthy and of reverted black currant bushes.

Three new early grapes show promise in State, H. M. WELLS (*Michigan Sta. Quart. Bul., 10 (1927), No. 2, pp. 46-48, figs. 2*).—In connection with brief descriptive notes, comments are given on the favorable performance of the Ontario, Portland, and Grieg grapes, the early ripening characteristics of which, it is believed, will probably extend the limits of grape growing northward in Michigan.

Experiments upon fertilizing the vine [trans. title], C. DUSSERE (*Ann. Agr. Suisse, 27 (1926), No. 2, pp. 226-228*).—At Lausanne, Switzerland, vinifera grapes fertilized with animal manure at the rate of 28.34 tons per acre only slightly outyielded those receiving half the manure supplemented with complete chemicals. The difference in respect to sugar and acid percentages in the must were altogether insignificant, and the increased yield was offset by the greater cost of the manure. It is pointed out, however, that similar results might not obtain on very light or very compact soils.

The value of careful selection of nursery stock was shown in an approximately 20 per cent increased yield over a 6-year period from carefully selected grape plants, as compared with random stock. The acid and sugar contents of the must were, however, very similar.

The banana: Its history, cultivation, and place among staple foods, P. K. REYNOLDS (*Boston: Houghton Mifflin Co., 1927, pp. XIII+181, figs. 45*).—A popular account concerning culture, transportation, food value, etc.

The effects of phosphorus and sulfur fertilizers on flower production of roses and carnations, F. F. WEINARD and P. A. LEHENBAUER (*Illinois Sta. Bul. 299 (1927), pp. 77-104, figs. 3*).—Tests of various fertilizers as supplements for cattle manure in the fertilizing of roses and carnations indicated that certain materials, particularly acid phosphate, have definite value. Supplementing manure, acid phosphate used at the rate of 40 lbs. per 100 sq. ft. of greenhouse bench increased the yields of Hoosier Beauty, Ophelia, Killarney, and White Killarney roses in a 3-year test approximately 6 to 10 per cent. Acid phosphate was more effective than steamed bone, but did not have equal effect on succeeding crops. That acid phosphate owes its effectiveness in a soil for roses to phosphorus rather than sulfur was shown in a comparison between acid phosphate and gypsum. Furthermore, the yields obtained from steamed bone and gypsum averaged about 5 per cent higher than with gypsum alone.

Increases in carnation flowers ranging as high as 7 per cent and averaging 3 per cent over a 3-year period were obtained from the addition of acid phosphate at the rate of 40 lbs. per 100 sq. ft. At the same time neither gypsum nor bone meal gave any increase. No consistent relation was noted between fertilizer treatment and the number of split calyxes.

The orchids, R. SCHLECHTER, rev. by E. MIETHE (*Die Orchidaceen. Berlin: Paul Parey, 1927, 2 ed., rev., pp. XII+960, pls. 16, figs. 250*).—A monograph consisting principally of descriptive material supplemented with general cultural information. Some of the illustrations are in color. O. Beyrodt and P. Wolter discuss the construction of orchid houses, and S. Wilke and H. Klebahn the controlling of animal and fungus pests, respectively.

The modern English garden, E. H. M. COX (*London: Country Life, [1927], pp. XXIV+192, figs. 225*).—This book, consisting largely of photographic reproductions, shows the trend in modern English gardens.

FORESTRY

Forests and water in the light of scientific investigation, R. ZON (*U. S. Dept. Agr., Forest Serv.*, 1927, pp. [1]+106, figs. 2).—A comprehensive review with bibliography of world-wide studies upon the influence of forests upon climate, rainfall, temperature, and moisture content of the soil, run-off, and the flow of streams. It is shown that forests tend to equalize the flow of streams throughout the year by making the low stages higher and the high stages lower; but do not necessarily prevent floods although aiding materially in reducing their destructiveness.

American forests and forest products (*U. S. Dept. Agr., Statis. Bul.* 21 (1927), pp. 324, figs. 4).—Statistical tables as follows: (1) Forest statistics of the United States, (2) national lumber tables, (3) State tables of lumber production, (4) lumber production of principal kinds of wood, (5) pulpwood, wood pulp, and paper statistics, and (6) minor forest products and wood preservation are offered to serve as a reference book for foresters, economists, and other interested parties.

Some results of the Michigan woodlot tax act, K. DRESSEL (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 59-63).—Concrete examples are given of the working out of the Michigan woodlot tax reduction act of 1917 which defers the heavy tax on timber to the time of cutting.

Congress reports concerning forestry and forest science in Suomi (Finland) (*Silva Fennica*, No. 4 (1927), pp. 90).—This pamphlet contains the following papers relating to forestry in Finland: The Organization of Forest Administration in Suomi (pp. 3-19), Teaching of Forestry in Suomi: General Features (pp. 20-28), Some Aspects of Forest Research Work (pp. 29-34), and The Scientific Foundation of Forestry as Exemplified Chiefly by Forest Research Work in Suomi (pp. 77-90), all by A. K. Cajander; The Inventory of Forest Resources (pp. 35-43) and Preparation of Growth and Yield Tables (pp. 44-52), both by Y. Ilvessalo; Cultivation of Foreign Species of Trees, by L. Ilvessalo (pp. 53-63); What Points of View Have to be Taken into Consideration when Draining Swamp Lands for Afforestation, by O. J. Lukkala (pp. 64-70); and Forest Fire Insurance in Suomi, by T. W. Paavonen (pp. 71-76).

Shortleaf pine primer, W. R. MATTOON (*U. S. Dept. Agr., Farmers' Bul.* 1534 (1927), pp. [2]+42, figs. 27).—Declaring that the shortleaf pine is one of the most profitable forest trees to grow over a large area of the uplands and mountains from New Jersey to Georgia and west to Oklahoma and Texas, the author describes the tree with reference to the habit and rate of growth, yield per acre, methods of reforestation, thinning, cutting, protection, marketing, etc.

Acceleration of growth in western yellow pine after cutting, G. A. PEARSON and A. D. FOLLWEILER (*Jour. Forestry*, 25 (1927), No. 8, pp. 981-988, figs. 2).—Annual ring measurements taken in the Tusayan National Forest of Arizona upon 75 western yellow pine trees, remnants of a stand which had been cut over some 40 years previous, showed variations in response to liberation in accordance with the age of the trees. In old trees, averaging 286 years, acceleration was maintained from breast height to the top of the second log (32 ft.) and fell off irregularly beyond that point. In younger trees (144 years) the percentage of acceleration declined steadily from breast height to the top of the second log. The lesser diameter gain of the younger trees is believed to be due to the fact that these trees in some instances made as much as 30-ft. height gain following liberation. The tendency for liberated trees to make their greatest radial gain near the boll suggests that volume tables based on virgin stands are not strictly applicable to cut-over forests.

Form-class taper curves and volume tables and their application, C. E. BEHRE (*Jour. Agr. Research* [U. S.], 35 (1927), No. 8, pp. 673-744, figs. 28).—Asserting that unsatisfactory results obtained in the application of general volume tables may be due primarily to failure to recognize differences in form quotient and variations in bark thickness and butt swell at breast height, the author presents a form class percentile taper system based on the fundamental principle that taper expressed in relative terms is independent of diameter and height for trees of a given form class. Among outstanding advantages of the percentile taper curve system are the relatively small number of trees required as a basis for dependable tables and the fact that the tables are as strong for extreme values in either diameter or height as they are for well represented size classes. Furthermore, the percentile system provides a basis for analyzing disturbing factors in the use of volume tables and permits the separate evaluation of errors from various sources.

DISEASES OF PLANTS

[Report of the] department of plant pathology, J. F. ADAMS and T. F. MANNS (*Delaware Sta. Bul.* 152 (1927), pp. 40-51, pls. 2).—Cooperative work with the U. S. Department of Agriculture is said to have shown that the percentage of wilt infection of sweet potato varieties varies from year to year.

Continued studies of soil pox of sweet potatoes are reported. A species of *Actinomyces* was repeatedly isolated from typical pox lesions, and culture work was carried on with this form, which is designated for convenience as *A. pox*, and it was compared with *A. chromogenus* and *A. poolensis*, related organisms. Negative results were obtained in inoculations with *A. chromogenus* and *A. poolensis*, while *A. pox* was found to be pathogenic and was always reisolated from typical lesions. Preliminary experiments showed that the fungus which causes pox secretes a toxin or enzyme that is very active not only on sweet potatoes but on white potatoes as well.

Field observations on diseases of soy beans and cowpeas have indicated the probable carrying over on the seed of some of the soy bean diseases. A planting of cowpeas was observed to be severely attacked by *Cladosporium vignae*.

Histological studies of the bacterial spot of stone fruits have shown the distribution of masses of bacteria in tissues at considerable distances from the visible cankers. It was found that under favorable conditions infection may occur throughout the entire growing season.

Negative results were obtained in experiments on the dissemination of peach yellows by the peach curculio, and further trials with the peach leafhopper, tarnished plant bug, and the black peach aphid have so far failed to give positive results.

In experiments on the control of tomato foot rot in seed beds, better results were obtained by spraying with Bordeaux mixture than with dusting. Comparisons made of 10, 15, and 20 per cent copper dusts showed under extreme conditions that leaf blight was not controlled on cantaloupes by the 10 per cent dust, but the others were effective. Negative results were obtained in experiments to determine the source of the original infection of downy mildew of cucurbits.

A study was made of a disease of dahlias characterized by dwarfed or stunted plants that showed that the disease was not transmitted by propagation. It is considered to be probably due to soil or feeding factors.

[Report of the Missouri Station department of] botany (*Missouri Sta. Bul.* 256 (1927), pp. 62, 63).—In continuation of studies of the tomato wilt

fungus, *Fusarium lycopersici* (E. S. R., 57, p. 442), I. T. Scott and B. R. Branstetter found by comparing washed and unwashed mats of the fungus mycellum that it is very important to use washed fungus tissues in experiments concerned with the action of single salt solutions at different H-ion concentrations. It is believed that experiments with the mats in distilled water indicate that the change in reaction in single salt solutions at different pH values was probably not due to the leaching out of organic acids and salts, but appeared to be most easily explained on the basis of a protein analogy.

Studies of corn root rot are said to show that increased yields were secured by using nearly disease-free seed corn selected by the improved rag doll germination method. Heavily infected seed planted thickly to secure an equal stand gave similar yields. Normal and healthy corn plants grown in sterilized infected soil and inoculated with pure cultures of *Diplodia zaeae*, *Cephalosporium acremonium*, *F. moniliforme*, and *Gibberella saubinetii* produced plants with normal and healthy root systems, while unsterilized soil invariably produced plants with badly rotted root systems. Studies of the rotted roots revealed the presence of a fungus similar to that described by Vallean et al. (E. S. R., 55, p. 749). The cause of this root rot has been determined to be a *Pythium*-like fungus.

An investigation of the organisms associated with alfalfa root rots and wilts is said to indicate that the fungi are secondary to bacterial wilt and root rot and winter injury.

Miscellaneous investigations by Scott and C. M. Tucker show that the bacterial wilt and root rot of alfalfa (*Aplanobacter insidiosum*) has caused considerable damage in various parts of the State. A bacterial disease of sweet clover is reported, in which a bacterium was isolated that possesses morphological and cultural characters differing from those of the alfalfa wilt. An intensive study was made of all available temperate and tropical climate species of *Phytophthora*.

Second [and third] annual report[s] of the department of plant pathology, [Seale-Hayne Agricultural College, 1924-25 and 1925-26], W. E. H. HODSON and A. BEAUMONT (*Seale-Hayne Agr. Col. Pamphlets 19 (1926) pp. 32; 21 (1927), pp. 25*).—The first of these two reports, continuing the one previously noted (E. S. R., 55, p. 651), includes, besides notes on insect pest activity and other matters, brief accounts of nematodes (*Tylenchus dipsaci* and *Ocephalobus* sp.) on oats, blackleg of mangels (*Phoma betae*), chocolate spot of beans (*Bacillus lathyri*), apple scab (*Venturia inaequalis*), die-back of fruit trees (several fungi present), raspberry diseases of the Southwest (several fungi), narcissus bulb injuries (*T. dipsaci*) and diseases (*Fusarium bulbigenum*, *Penicillium* sp., and *Ramularia vallisumbrosae*), and narcissus foliage injury (*R. vallisumbrosae*, *Botrytis cinerea*, and *Stagonospora narcissi*).

In the report for 1925-26, notes on diseases and pests of the year include brief mention of the cereal diseases oat loose smut, wheat whitehead (*Ophiobolus cariceti*), and barley leaf stripe (*Helminthosporium gramineum*); the potato blight disease; the root crops diseases swede mildew (*Erysiphe polygoni*), turnip and swede dry-rot (*Phoma napobrassicae*), turnip bacterial rot (? *Bacillus carotovorus*), mangel and sugar beet heart rot (*P. betae*), and mangel rust (*Uromyces betae*); bean chocolate spot; tomato rust (*Oladosporium fulvum*) and blossom-end rot (physiological); cabbage and broccoli leaf spot (*Mycosphaerella brassicicola*), cabbage mildew (*Peronospora parasitica*), white rust (*Cystopus candidus*), and rot (*Botrytis* sp.); fruit tree diseases (apple scab, mildew, wilt, and brown rot); American gooseberry mildew; black currant leaf spot (*Pseudopeziza ribis*); and diseases of flowers, aster blackleg, Michaelmas

daisy (and other plants) mildew (*E. polygoni*), narcissus leaf spots (*Ramularia vallisumbrosae* and *Stagonospora narcissi*) and bulb rots (*Fusarium* spp.). Separate articles are given also on hard rot of gladioli (*Septoria gladioli*) and tulip fire (*B. tulipae*). Short accounts are given of damping-off in oats (*Pythium debaryanum*) and Botrytis diseases in Devon and Cornwall. An appendix contains a classified list of plant fungus diseases of Devon and Cornwall.

Bacterial diseases of plants [trans. title], E. F. SMITH (*Rev. Gén. Sci.*, 36 (1925), No. 5, pp. 134-139; abs. in *Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 82-91).—A brief history is given in French of discovery and research regarding bacterial plant diseases since 1877 and of the author's own researches since 1893.

Bacteriophage in plant pathology [trans. title], C. SIBILIA (*Bol. R. Stat. Patol. Vég. [Rome]*, n. ser., 6 (1926), No. 3, pp. 200-209).—Somewhat general treatment is given the matter of bacteriophage of plant origin (with a short bibliography of that phase) as regards the technique of isolation, dispersion, and behavior of bacteriophage in the plant kingdom, polyvalence and nature of the plant bacteriophage, and the relation of bacteriophage to immunity.

On the resistance of the cuticle to penetration by fungal hyphae, W. BROWN and C. C. HARVEY (*Brit. Assoc. Adv. Sci. Rpt.*, 94 (1926), pp. 408-409).—Failure to demonstrate any cuticle-dissolving substance and experiments with artificially prepared membranes are considered to show that parasitic fungi may penetrate plant cuticle in a purely mechanical manner. By using membranes of graded resistance the mechanical penetrating powers of fungi can be compared. Intact plant surfaces not ordinarily attacked by a given fungus are readily penetrated when the support of the underlying tissue is removed, that is, when the supporting tissue is killed, removed, or weakened as to turgor by plasmolysis of underlying cells.

The effect of mosaic on the content of the plant cell, M. T. COOK (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 229-238, pls. 6).—The studies reported in the first paper (*E. S. R.*, 55, p. 449) and restricted to sugar cane were extended to include tobacco for the purpose of comparison. The greater part was devoted to the chloroplasts, but some attention was given also to the mosaic leaf pattern and to other points.

The mosaic pattern, at first indistinct on young leaves, becomes prominent as growth proceeds, then becomes less distinct with age, while chlorotic areas also tend to turn green. Chloroplasts in chlorotic areas are fewer and smaller, though no evidence of disintegration appears. The tendency of the chlorotic areas to become green with age is due to an increase in number and size of the chloroplasts. The chlorotic areas increase in size by cell division and cell growth and not by infection or disintegration. Green areas in a chlorotic area can be detected by cytological studies before they are perceptible to the unaided eye. The small size and number of chloroplasts is common to both sugar cane and tobacco when infected with mosaic. The nuclei of diseased cane cells are usually enlarged or deformed, but this is not true of tobacco.

Pycnidial forms of *Ophiobolus graminis* and *O. herpotrichus* [trans. title], L. GUYOT (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 74-81, pls. 3).—Observation and experimentation are briefly detailed as regards *O. graminis* and *O. herpotrichus* and forms more or less related to these.

The enzymes of *Pythiacystis citrophthora* Sm. and Sm., L. J. KLOTZ (*Hilgardia [California Sta.]*, 3 (1927), No. 2, pp. 27-40).—An account is given of a study of the enzymes produced by the fungus, *P. citrophthora*, when grown in pure culture. Positive evidence was obtained for the presence of some of the lower esterases, for diastase, invertase, maltase, emulsin, phloridzinase,

asparaginase, urease, peroxidase, and catalase. Less evidence was found for the presence of cytase, lactase, and hesperidinase. Only slight indications were obtained for inulase, pectinase, protease, and glycolase. Negative results were obtained in tests for cellulase, amidases, zymase, oxidase, and a number of other enzymes.

Recent observations on rusts [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 60-64).—A brief account is given of observations on *Puccinia simplex* and *P. glumarum*.

Seedbed treatment for diseases of cruciferous crops on Long Island (*New York State Sta. Bul.* 537, pop. ed. (1927), pp. 7, fig. 1).—This is a popular edition of a bulletin previously noted (*E. S. R.*, 56, p. 845).

Cytological studies on virus diseases of solanaceous plants, I. A. HOGGAN (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 7, pp. 651-671, pls. 3, figs. 3).—Studies were made by the Wisconsin Experiment Station of virus diseases of solanaceous plants, and in the case of ordinary tobacco mosaic two types of cell inclusions were found to be invariably present in the chlorotic areas of mottled leaves. One type, to which the name x-bodies is given, consists of protoplasmic, vacuolate bodies previously described by various writers, and the other consists of striate material described by Rawlins and Johnson (*E. S. R.*, 56, p. 652). Both types of cell inclusion were found to be a constant feature of mosaic on solanaceous host plants which developed definite symptoms of mottling or chlorosis. Similar inclusions were associated with two other virus diseases of solanaceous plants, namely, yellow tobacco mosaic and medium tobacco mosaic. Eight other virus diseases were studied, but no inclusions of either type in any of the host plants were found.

It is believed by the author that the presence or absence of such inclusions may be used in the identification of different virus diseases in case a single host species is susceptible to more than one virus.

As a result of the investigation it is concluded that the evidence on the whole indicates that the x-bodies are not of the nature of causal organisms.

The action of alkaline Bordeaux mixtures [trans. title], MR. and MRS. G. VILLEDIEU (*Compt. Rend. Acad. Agr. France*, 10 (1924), No. 31, pp. 886-898).—Independently of any physical (drying) action, basic Bordeaux sprays act in three different ways. During the first two days they owe their high efficiency to the free lime which they contain. After this they may act by the concentration of the salt solutions, or finally through their basic copper compounds if these are mobile.

A study of copper powders [trans. title], MR. and MRS. G. VILLEDIEU (*Rev. Vitic.*, 62 (1925), No. 1598, pp. 132-135).—The study of copper, previously in spray form as above noted, has been extended to copper present to the amount of 2 per cent in a copper-talc dust as fine (even if irregular) particles, the apparent insolubility of which in distilled water had been verified by rigid tests and had been further assured, as regards a certain part, by oxidation.

It is regarded as having been conclusively proved that in case of Bordeaux and of Burgundy mixture the copper acts only by actual contact and under the form of insoluble basic compounds. This theory of the authors is regarded as being opposed to that of Millardet and others after him that some little copper is dissolved and acts in that form.

It is regarded by the present authors as necessary and sufficient that the copper particles be uniformly distributed, and that for this purpose they must be very fine and by virtue of that fact capable of remaining in suspension in water. The quantity (proportion) of copper present is of little significance, as it is its state of very fine division, insuring its presence every-

where throughout the liquid so that even the smallest droplet will contain the fine copper particles, that is important. It is claimed that when contact of the copper particles with the zoospores is thus assured by the extreme fineness of the particles, the actual amount of copper present may be very small.

Cereal diseases [trans. title], F. MOREAU (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 31-37).—A detailed account is given chiefly of cereal rusts as regards incidence and resistance.

The present state of questions relating to rusts of cereals, I-IV [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), Nos. 2, pp. 89-107; 3, pp. 184-200; 4, pp. 265-285).—The four main parts of this account deal, respectively, with species and biological forms of *Puccinia* which attack cereals; the technique of experimental culture of rusts; overwintering of cereal rusts; and degrees of receptivity and of resistance of cereals to rust in relation to internal and external causes. Ample bibliographies are included.

Cereal rusts in fall and winter [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 21-27).—Recent observations are briefly recorded.

Cereal foot rot [trans. title], B. PEYRONEL (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 4, pp. 285-336).—This account of observations and studies, with an extensive bibliography on cereal foot rots, concludes by recommending as preventive means and measures complete disinfection of the seed, correct distance with a view to good insolation, adoption of resistant strains and of strains producing moderate foliage, systematic management of soils, balanced fertilization, and rational rotation.

New dust treatments for oats smuts, J. D. SAYRE and R. C. THOMAS (*Science*, 66 (1927), No. 1713, p. 398).—In a previous publication by Thomas (*E. S. R.*, 53, p. 543) it was claimed that copper carbonate alone is not effective in controlling oat smuts. However, when 1 part of copper carbonate or copper sulfate was mixed with 2 parts of mercuric bichloride the dust was effective. Later a mixture of 1 part of copper sulfate, 1 part of mercuric bichloride, and 1 part of cresylic acid was found to control oat smuts, but both treatments are considered too expensive for general use.

As none of these dusts was considered entirely satisfactory and the liquid treatment is objectionable, the authors prepared a formaldehyde mixture consisting of 40 per cent formaldehyde with infusorial earth or charcoal. In the tests, dusts containing 9, 15, and 25 per cent of the 40 per cent formaldehyde, used at the rate of 3 oz. per bushel, reduced smut to less than 1 per cent as compared with 47 per cent in check lots.

Another new treatment which has given promising results consists of a mixture of finely ground solid iodine with infusorial earth. The dust prepared contained 5 per cent by weight of iodine and was applied at the same rate as formaldehyde dust. Only three smutted heads were found in three $\frac{1}{16}$ -acre plats the seed of which had been treated with this dust.

Soil factors influencing the development of the mosaic disease in winter wheat, R. W. WEBB (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 7, pp. 587-614, figs. 8).—Studies were made of Harvest Queen and Currell, two varieties of winter wheat which are said to be very susceptible to rosette and mottling, both of which are considered different expressions of the same disease. The varieties of wheat were tested under various conditions of soil temperature and moisture, and it was found that the occurrence and subsequent development of the mosaic disease of winter wheat were closely associated with normally active growth of the seedling. The disease developed only within a relatively restricted soil temperature range and was decidedly favored by high soil moisture. The susceptibility of the seedlings was found to be influenced by

their stages of development. In general, the 4-week seedlings appeared to be most susceptible. Comparing the different varietal responses, it was found that mottling was more general than rosette, and the variety Harvest Queen showed higher percentages of mottled plants than the variety Currell. Surface sterilization of the subterranean parts of infected seedlings with corrosive sublimate at the time of transplanting noticeably reduced the occurrence of rosette, but leaf mottling was not similarly affected.

The evidence obtained in this investigation did not throw any light on the nature of the causal agent, but it apparently eliminated *Helminthosporium sativum* as the cause of either the rosette or mottling phases of the disease.

Wheat rusts [trans. title], H. J. MARESQUELLE (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 56, 57).—A brief account is given of wheat rusts at Bellevue, France, during 1924.

Onion-leaf anthracnose, J. A. B. NOLLA (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 245-256, pls. 3).—A new leaf and bulb scale anthracnose of onions is said to have been discovered in one of the eastern districts of Porto Rico in January, 1924. A brief account is presented of the investigation, with description of the organism herein named *Colletotrichum chardonianum* n. sp.

The market onion (*Allium cepa*) has been most seriously affected, the false shallot to a lesser extent. The latter is infected under laboratory or field conditions. Plants of all ages are equally susceptible. The greatest damage occurred mostly in plants three months old during long and heavy rainfall. The disease has been named onion leaf anthracnose to avoid confusion with smudge, often referred to as onion anthracnose, and with diseases known as onion leaf spot. An account is given in this connection of both the saprogenesis and the pathogenesis. No resistance is noted at any age. Apparently the organism overwinters as mycelium in soil debris. The conidia appear to resist sulfur fungicides. Laboratory experiments show a protective effect of copper fungicides, particularly colloidal copper.

Sugar beet nematode [trans. title], L. SEMICHON (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 1, pp. 40-43).—An account is given of observation and experimentation on *Heterodera schachtii* obtained from beet roots sent from Morocco.

A cytological study of Ceratostomella adiposum (Butl.) comb. nov., the black-rot fungus of sugar cane, G. B. SARTORIS (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 7, pp. 577-585, figs. 4).—A report is given of a cytological study of the fungus which causes a black rot of sugar cane in India, sometimes resulting in considerable damage to seed pieces. The disease was found in Louisiana in 1924 and again in 1926, where losses of from 20 to 30 per cent are reported through reduced stand for two varieties of cane.

As a result of the study the author claims that the fungus described by Butler as *Sphaeronema adiposum* (E. S. R., 18, p. 450) is in reality an ascomycete belonging to the genus *Ceratostomella*, and that the new name for the fungus should be *C. adiposum* n. comb.

The eye-spot disease of sugar cane, M. T. COOK (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 207-227, pls. 6).—Sugar cane eye spot (*Helminthosporium sacchari*) is severe in Porto Rico, F. C. 306, D. 109, and H. 109 being susceptible in this order as shown by the severity of the attack, and Uba and P. O. J. canes being the most resistant. Susceptibility is correlated with leaf fiber content, and to some extent with sucrose content. Young leaves are more susceptible than old, and bases and upper surfaces more than tips and lower surfaces. Spores germinate readily in water and penetrate without regard to

stomata. The greatest mycelial growth is in the parenchyma tissues. Spores appear more abundantly on the lower than on the upper leaf surface. The disease is most severe during cool, wet months, temperature thus appearing as the most important environmental factor. The use of resistant strains appears to be the most satisfactory means of control.

Photo-synthesis of the sugar cane mosaic plant, M. T. COOK (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 239-242, pl. 1).—The author has studied the photosynthetic activity of mosaic sugar cane plants as compared with that of normal plants, these studies being restricted to plants collected between 5 and 6 a. m. and 2 and 3 p. m.

The normal plants and the green areas of the diseased plants performed their photosynthesis in a normal manner and showed also a large amount of starch in the afternoon and very little in the morning, while the white and light green or yellowish areas showed a small amount of starch in the afternoon and practically none in the early morning. Evidently the starch-forming capacity of the mosaic cane was reduced in proportion to the amount of infection, though the power of translocation was practically unimpaired. The reverse was found to be true in case of peach yellows and little peach (E. S. R., 47, p. 844).

The studies indicate that we may have two types of disease, one generally represented by the various mosaics in which the photosynthetic activities are greatly reduced and another which is represented by peach yellows and little peach, in which starch is formed in the leaves but not transported to other parts of the plant, with the result that the leaves become hard and leathery. The old leaves of sugar cane infected with mosaic produced more starch than did the young leaves of the same plants. This is supposedly due to the fact that the chloroplasts in chlorotic areas of the diseased plants tend to increase in size and number with the age of the leaf.

A protozoan in tissues of sugar cane showing mosaic [trans. title], R. AVERNA-SACCÀ (*Bol. Agr. [Sao Paulo]*, 27. ser., 1926, Nos. 6-7, pp. 183-204; 8-9, pp. 252-273, pls. 4, figs. 6; 10, pp. 303-319, figs. 6; 11-12, pp. 388-398, figs. 5; 28. ser., 1927, No. 2-3, pp. 173-182).—Both general and particular aspects and incidences of mosaic are dealt with as regards various plants, and in some detail as regards sugar cane. Numerous references are given.

Precipitation of the virus of tobacco mosaic, C. G. VINSON (*Science*, 66 (1927), No. 1711, pp. 357, 358).—The author claims to have precipitated the virus of tobacco mosaic from freshly cut diseased tobacco tissues which were frozen, thawed, and then subjected to high pressure, the juice being treated with acetone at -8° C. This resulted in the formation of a precipitate which was found to be readily soluble in distilled water. Experiments with young tobacco plants inoculated with the solution showed it to be highly infectious. When the supernatant liquid was decanted and then centrifuged to free it from all traces of the precipitate and diluted with two parts of distilled water, it was not infectious. It is claimed that absolute alcohol may be used in place of acetone under the above conditions. At about 100 per cent saturation and -8° , ammonium sulfate was found to salt out from the juice material which, when filtered off and dried, dissolved readily in distilled water. Plants inoculated with this solution also showed the disease.

Rate of virus spread in tomato plants, W. A. McCURBIN and F. F. SMITH (*Science*, 66 (1927), No. 1716, pp. 486, 487).—The results are given of preliminary experiments to determine the rate at which the mosaic virus spreads.

Eight tomato plants were grown in pots in such a manner as to develop horizontal branches, which were so bent and led under the earth in a secondary pot as to encourage rooting and thus form a readily detachable plant. When

the secondary plants were well rooted but still attached to the parent plant, a single shoot of the plant was inoculated with freshly expressed juice from tomato leaves showing marked mosaic. After inoculation single secondary plants were removed from each parent plant at intervals of 3, 10, 15, 19, and 24 days.

As a result of these experiments it was found that the infective principle was unable to pass from the point of inoculation beyond the point of separation in any case in 3 days, but in half of the cases not more than 10 days were required to traverse this distance. On the basis of the transfer of mosaic virus which took place through the shoots of the tomato plant, the authors claim that it progressed at the rate of 2 in. per day or from 1 to 2 mm. per hour.

Studies in tomato streak, G. H. BERKELEY (*Sci. Agr.*, 7 (1927), No. 6, pp. 210-223, figs. 8).—During the fall of 1924 and the spring of 1925 severe outbreaks of tomato streak occurred in greenhouses at Vineland, Ontario, some features being a great variety in the streak symptoms and inconsistencies as to predisposing factors and as to the manner of spread, which are up to the present time unaccounted for. Preliminary trials in relation to control are outlined. Recommendations for control indicate the necessity of setting healthy plants and of limiting the use of nitrogen, also the importance of appropriate greenhouse management.

Experimental evidence confirms the view that streak is of the filtrable virus type of disease. All parts of a plant are said to carry the infective principle. Susceptibility of tomato plant to streak seems to be about equal at all times. Varieties found to be equally susceptible to streak include Sunrise, Chalk Jewel, Earliana, Bonny Best, New Globe, Grand Rapids, and Veal. Juice from the apparently healthy potato plants produced definite streak in tomatoes, as did likewise potato mosaic and potato streak juices. The experimental evidence here reported does not confirm the theory of a combination of tomato and of potato mosaic viruses as the cause of streak. Tomato streak is transferable to healthy tobacco, in which it produces mosaic symptoms with necrosis. Tobacco streak is transferable to tobacco and back to tomato. Mosaic potato also produces streak in tobacco as in tomato.

Physiological drop of fruits in Delaware, L. R. DETJEN and G. F. GRAY (*Delaware Sta. Bul.* 152 (1927), pp. 25-30).—In continuation of these investigations (*E. S. R.*, 56, p. 353), the authors report that apple trees of the variety Jonathan shed their immature fruits in a single large compound wave, with one major and several minor crests. Stayman was found to shed its young fruits in a compound wave, with four major crests. Seasonal variations in shedding were also observed.

In a study of the influence of some factors on fruit shedding, neither the method of application nor withholding of nitrogen, pruning, or spraying as ordinarily practiced had any effect. The position of buds in the flower cluster and time of blossoming did not appear to be definitely correlated with the dropping of fruits.

Apricot die-back [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg.* [Rome], n. ser., 6 (1926), No. 4, pp. 377-380).—The author observed in Tuscany a die-back of apricots associated with several fungi included in or related to *Olaeterosporium carpophilum*, *Coryneum beyerinckii*, *Verticillium* sp., or *Oxytospora* sp.

Small cherry in English Morello (*New York State Sta. Bul.* 540, pop. ed. (1927), pp. 7, pls. 2).—A popular edition of the bulletin previously noted (*E. S. R.*, 56, p. 850).

Internerval maculate chlorosis in leaves of citrus plants [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome]*, n. ser., 6 (1926), No. 4, pp. 380-384, figs. 2).—An internerval maculate chlorosis affecting the leaves alike of lemons, oranges, and mandarins is described as occurring in connection with the seemingly predisposing presence of *Colletotrichum gloeosporioides*.

Mango wither-tip (*Colletotrichum gloeosporioides* Penz.), J. A. B. NOLLA (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 257, 258, pl. 1).—The author presents briefly further evidence (E. S. R., 57, p. 851) of the pathogenicity of strains of *C. gloeosporioides*. A dieback of mango followed heavy rains and new growth. This presents a case where a fungus held to be a saprophyte under many conditions exhibits in some of its strains a strictly parasitic action on one of its hosts.

The European larch canker in America, P. SPAULDING and P. V. SİGGERS (*Science*, 66 (1927), No. 1716, pp. 480, 481).—The occurrence is reported of the European larch canker (*Dasyctypha calycina*) on four different estates in the towns of Hamilton, Ipswich, and Danvers, Mass. The fungus was found to attack the European larch (*Larix europaea*), the Japanese larch (*L. leptolepis*), the eastern American larch (*L. laricina*), the Douglas fir (*Pseudotsuga taxifolia*), the pitch pine (*Pinus rigida*), and the Scotch pine (*P. sylvestris*). In Europe the fungus is reported to attack additional native or introduced species.

The origin of the disease is said to be conclusively indicated by the fact that the European and Japanese larches on two of the estates were imported as seedlings from Scotland in 1904 and 1907. Some of the diseased Douglas fir is also known to have been imported as seedlings. The amount of infection in European larch aggregated 100 per cent. The Japanese larch was relatively resistant, but the Douglas fir trees near diseased European larch were affected to about 80 per cent.

A die-back of *Pinus radiata* and *P. muricata* caused by the fungus *Botryodiplodia pinea* (Desm.) Petr., K. M. CURTIS (*New Zeal. Inst. Trans. and Proc.*, 56 (1926), pp. 52-57, pls. 2, figs. 7).—In August, 1924, attention was drawn to what appeared to be an unrecorded die-back disease of *P. radiata* and *P. muricata* in New Zealand. The fungus is referred to *B. pinea*.

Three fungous diseases of *Salix* in New Zealand, and some saprophytic fungi found on the same hosts, B. J. MURRAY (*New Zeal. Inst. Trans. and Proc.*, 56 (1926), pp. 58-70, pls. 4, figs. 10).—An account is given of *Marssonina salicicola* on *S. babylonica*, *Macrophoma salicis* on *S. fragilis*, *Gloeosporium capreae* on the same willow, and *Gnomonia bullata* n. sp., technically described as found on attached but dead twigs and branches of *S. babylonica* and *S. fragilis*. Some fungi supposedly saprophytic found on willows in the Nelson district are named.

The *Fusarium* wilt of China asters, A. B. JACKSON (*Sci. Agr.*, 7 (1927), No. 7, pp. 233-247, figs. 12).—In Ontario, aster wilt is very prevalent and destructive, all varieties being susceptible. It differs entirely from yellows and aster bug injury, which are also abundant in Ontario. Wilt is usually caused by *Fusarium conglutinans callistephi*, which is not pathogenic to cabbage, but cabbage yellows is caused by *F. conglutinans*. *F. conglutinans* and *F. conglutinans callistephi* both show acidity tolerance ranging from -30 to +30 Fuller scale. Four other *Fusaria* isolated from aster were strongly pathogenic. Variations in cultural characters are noted on different growth media. Pathogenic forms are described. Temperatures of 20 to 25° C. (68 to 77° F.) were favorable to wilt; temperatures of 17 to 20° unfavorable. Aster wilt is about equally severe on clay, sand, or loam soil. Heavy soil infection is a factor. Effective

seed disinfectants include mercuric chloride 0.1 per cent and uspulun 0.25 per cent. Soil disinfection may be accomplished safely by thoroughly soaking with 0.1 per cent mercuric chloride at the time the seed is planted.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The American grey squirrel (*Neosciurus carolinensis* Gmelin) in Kent, Sussex, and Surrey. F. V. THEOBALD (*Southeast. Agr. Col., Wye. Bul. 4* (1926), pp. 13, pls. 3).—An account of the habits and importance of this squirrel in Kent, Sussex, and Surrey. A native of North America, it was first liberated in Great Britain in 1889.

Bird companions. A. K. MAIN (*Boston: Richard G. Badger, 1925, pp. 287, pls. 29*).—This is a practical account of 150 song birds found east of the Mississippi, and particularly those in Wisconsin. The descriptions and biographies are grouped according to the A. O. U. check list. A key for identification by conspicuous markings is included.

Magpie control in Wyoming. A. M. DAY (*Wyo. Agr. Col. Ext. Circ. 20* (1927), pp. 8, figs. 5).—Directions are given for the control of the magpie, particularly through the use of poison mixture. In many localities in Wyoming this bird is the worst enemy of poultrymen through the destruction of eggs.

Marine piling investigation. H. W. WALKER ET AL. (*Bul. Amer. Ry. Engin. Assoc., 28* (1926), No. 290, pp. 1-97, figs. 33).—This is a report of the Chemical Warfare Service, U. S. War Department, on marine borers which attack wooden structures, and deals particularly with preventive experimental work.

Animal enemies of cultivated plants in Bulgaria during the year 1925 [*trans. title*], P. CHORBADZHIEV (TSCHORBADJIEW) (*God. Otchet Drzhav. Zeml. Opitna i Kontrol. Sta. Sofiia* (Rap. Ann. Sta. Agron. Etat. Sofia, Bulgarie), 1925, pp. 218-257; *Ger. abs., p. 257*).—This is an account of 194 insects, 6 rodents, and 1 bird of importance in 1925.

[Entomological investigations at the Alabama Station (*Alabama Sta. Rpt. 1924, pp. 14, 15*).—The banded cucumber beetle is briefly reported upon by J. M. Robinson, who has found it to have become established as far north as Tallapoosa County and to be rather evenly distributed over the counties south of Lee and Perry. Long known in Mexico as a source of damage to beans, cotton, and various cucurbitaceous plants, it became a source of injury in Texas in 1905 and first caused damage in Alabama during the late summer and early fall in 1922 and 1923. The low temperature in the winter of 1923 reduced the abundance of this pest in 1924. It has been observed in Alabama feeding upon bunch beans, cabbage, okra, cotton, vetch, and onions.

It is reported by H. G. Good that when soil containing the pecan weevil larvae is treated with calcium cyanide all the larvae are killed, but it injures the tree when used in large quantities and placed close to the trees. Of 50 larvae placed in hibernation cages in sandy loam and 50 in clay pots, 13 of the former were found, 10 alive and 3 dead, while in the clay soil 7 were found, 3 of which were alive and 4 dead. In examining weevils in the clay pots the adults were found about 4 in. below the surface of the soil, and in the sandy loam they were 1 to 2 in. deeper.

In studies of the productivity of the cotton aphid by Good, commenced September 1, 1924, and carried through to November 15, 7 was the maximum number produced by any one aphid in a day.

The application of sodium fluoride to cattle infested with the chewing louse *Trichodectes scalaris* and the sucking lice *Linognathus vituli* and *Haematopinus eurysternus*, by rubbing in, resulted in practically a 100 per cent control of the three species, at an expense of less than 2 cts. per head.

In disinfection and cleaning work with Satsuma fruit, W. E. Hinds and J. M. Buck found that hot water at a temperature of 135° F. would kill all insects kept in the solution more than 1 minute. The Satsumas could be subjected to 135° for 2 minutes without injury to the color and keeping quality of the fruit, but when kept in water at 140° for more than 1 minute the color and keeping quality of the fruit was seriously affected. Sooty mold was completely removed from Satsumas by dipping them from 15 to 30 seconds in a caustic soda solution. This solution should be at the strength of 1 oz. per gallon of water and at a temperature varying from 125 to 135°. The fruit should be rinsed immediately after the treatment in fresh water at the same temperature and for a longer time.

[Sixth biennial report of the Montana State Board of Entomology, 1925-1926], R. A. COOLEY ET AL. (*Mont. State Bd. Ent. Bien. Rpt.*, 6 (1925-26), pp. 54, pl. 1, figs. 3).—Included in this report are papers on the Distribution and Spread of Rocky Mountain Spotted Fever in Montana, with a chart showing the life cycle of the spotted fever tick and the supposed cycle of the virus (pp. 19-28), Prophylactic Vaccination against Rocky Mountain Spotted Fever (p. 29), and Tularaemia and Its Occurrence in Montana (pp. 30-41), all by R. R. Parker and R. R. Spencer, and Control Work: Rocky Mountain Spotted Fever Control Districts, Bitter Root Valley, for the Period January 1, 1923, to December 31, 1926, by F. J. O'Donnell (pp. 41-54).

[Reports of the entomological department for the years 1924-25 and 1925-26], F. V. THEOBALD ([*Southeast. Agr. Col., Wye*], *Research and Advisory Dept. Ann. Rpts.* 1924-25, pp. 5-22; 1925-26, pp. 5-22).—These reports include accounts of the more noteworthy pests of the year, other pests inquired about, experiments with light traps and with carbolineum, aphid investigations, pyrethrum growing, etc. Brief accounts on gall midges for the two years, by H. F. Barnes, are included, as is an account of research on the life history of the cherry fruit moth (*Argyresthia nitidella*) and of work upon the black cherry aphid, by F. M. Wimbush, in the report for 1925-26.

[Papers on economic entomology] (*Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), pp. 30, 31, 184, 185, 188, 189, 190, 194).—The papers presented to this congress of interest to economic entomologists include the following: Control of the Coconut Caterpillar (*Nephantis serinopa*) by Its Parasites, by Y. Ramachandra Rao (pp. 30, 31), noted on page 455; Notes on Breeding Habits of the Common Earwig, *Anisolabis annulipes*, of Lahore, by R. Nath (p. 184); An Account of the Butterflies of Lahore, by D. R. Puri (p. 185); Grassi's Disease among Lac Insects, by S. Mahdihassan (p. 188); Dynamics of Lac Secretion, by M. Sreenivasaya (pp. 188, 189); Notes on Some Indian Lepidoptera with Abnormal Habits, by T. V. Ramakrishna Aiyar (p. 189); On the Sugar Cane Root Aphid *Tetraneura ulmi coimbatorensis* sub. sp. nov., by C. J. George (p. 190); A Preliminary Note on the Bionomics of the Pigeon Fly, *Lynchia maura* Bigot, by S. R. Nair (p. 190); Note on the Occurrence of Ovaries in the Worker of the Ant *Myrmecaria brunnea* Saunders, by D. Mukerjee (p. 190); and Positive Phototropism in Insects and Its Significance in Pest Control, by M. A. Husain (p. 194).

[Papers on economic insects] (*So. African Jour. Sci.*, 23 (1926), pp. 575-588, 644-649).—Two papers relating to economic insects are included as follows: The Bionomics of the Bruchidae, by S. H. Skaife (pp. 575-588), and Insects in Relation to Plant Disease, by T. J. Naude (pp. 644-649).

Insects attacking potatoes in North Wales, C. L. WALTON (*Ann. Appl. Biol.*, 12 (1925), No. 4, pp. 529-535).—This is a brief report of observations made in 200 different fields and gardens in 4 counties in North Wales. *Bourletiella lutea* (Lubbock), a minute yellow springtail, is said to be one

of the most abundant insects of North Wales. Notes are given on several species of aphids, of which *Macrosiphum solanifolii* Ashm. is by far the most abundant. The other aphids mentioned are the green peach aphid, *Aphis solanina* Passerini, and *A. rumicis*.

Notes on insects damaging sugar cane in Queensland, E. JARVIS (*Queensland Bur. Sugar Expt. Stas., Div. Ent. Bul. 3, 2 ed., rev. (1927), pp. 94, figs. 96*).—This is a revised edition of the bulletin previously noted (E. S. R., 36, p. 654).

Insect enemies of the rose, T. L. GUYTON and W. A. McCUBBIN (*Penn. Dept. Agr. Bul. 441 (1927), pp. 3-8, figs. 5*).—A brief account of the more important insects of the rose occurring in Pennsylvania.

The place of the native persimmon in nature in relation to other plant communities and to certain economic insects, C. O. EDDY (*Ohio Jour. Sci., 27 (1927), No. 4, pp. 187-199, figs. 4*).—This account, based upon studies in the Carolinas, deals particularly with the persimmon psylla (*Trioza diospyri* Ashm.), which, chiefly in the nymphal stage, attacks the native and the Japanese persimmon. The nymphs often cause folds and rolls in leaves of the native persimmon, and indentations or pits on the lower surface of the leaves of the Japanese persimmon. Soapy nicotine sulfate solutions gave some control of the egg stage, while nicotine sulfate with lime hydrate as a dust and Cyanogas "S" dusting mixture were more effective in the control of nymph and adult stages. The persimmon is said to be a host and the chief reservoir for the twig girdler in many parts of the South where pecans are grown, and thus to serve as a menace to the pecan industry. It is an important host of the webworm and is occasionally infested with San Jose scale.

Studies on contact insecticides.—Part VI, The insecticidal action of the fatty acids, their methyl esters and sodium and ammonium salts, F. TATTERSFIELD and C. T. GIMMINGHAM (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 331-358, figs. 9*).—In this sixth contribution (E. S. R., 57, p. 557), the authors report upon the quantitative determination of the toxicities to *Aphis rumicis* L. of the fatty acids from formic to stearic and of the sodium and ammonium salts and methyl esters, applied as sprays. Two unsaturated acids, undecenoic and oleic, are included.

"There is a rise in toxicity of the acids with increase of molecular weight as the series is ascended from acetic to undecylic acid. Formic acid is exceptional. Beyond undecylic acid there is a fall in toxicity, and acids higher in the series than tridecylic show only slight toxic action. The sodium salts of the fatty acids are in most cases much less toxic than the corresponding acids, though the difference is less marked with the higher acids. Oleic acid and sodium oleate are of the same order of toxicity.

"The ammonium salts are also generally less toxic than the corresponding acids, but the differences are much less than in the case of the sodium salts. With some of the higher acids, e. g., myristic and oleic, neutralization with ammonia increases toxicity. The relatively high toxicity of the ammonium salts may be due, at least partly, to liberation, by hydrolysis, of free fatty acid in a very finely divided state. Methylation of the fatty acids reduces toxicity; all the methyl esters are less toxic than the acids or ammonium salts. Both the ammonium salts and the methyl esters show, like the acids themselves, increase of toxicity with increase of molecular weight up to a certain point. The formates are exceptional. The fatty acids do not show marked toxicity to the eggs of *Selenia tetralunaria* Hüfn. at concentrations below 2 per cent.

"Possible relationships between certain physical properties (physical state, volatility, dissociation constants, partition coefficients, and surface tension) of

the fatty acids and their insecticidal action are discussed. Determination of partition coefficients as between olive oil and water and comparison of the figures with the relative toxicities show a steady rise in toxicity with a decrease in the partition coefficients (water/oil) from acetic to capric acid. Formic acid is again exceptional. With lauric and oleic acids there is a break in the correlation. The bearing of the solubility relationships of the acids on these results is considered."

Some fumigation tests with chloropicrin, L. F. HOYT and E. P. ELLENBERGER (*Indus. and Engin. Chem.*, 19 (1927), No. 4, pp. 461-464).—In the work conducted, various food products exposed to commercial fumigations with chloropicrin were apparently undamaged in any way when exposed in open containers for one week to a concentration of 0.8 lb. per 1,000 cu. ft.; likewise were raisins, prunes, nuts in shell, nut meats, lard, and nut margarine exposed in open containers for one week to a concentration of 1.33 lbs. per 1,000 cu. ft. Germination tests on buckwheat, corn, oats, sunflower, and wheat showed that exposure for one week to a concentration of 0.8 lb. chloropicrin per 1,000 cu. ft. had no detrimental effect on the germinating power of these seeds, the germinating power of wheat and buckwheat being even somewhat improved thereby. A list is given of 39 references to the literature.

The biology of Thysanoptera with reference to the cotton plant, I-III (*Ann. Appl. Biol.*, 14 (1927), No. 4, pp. 482-500, figs. 3; pp. 501-512, figs. 3; pp. 513-528, figs. 8).—This contribution consists of three parts.

I. *The relation between degree of infestation and water supplied*, R. A. Wardle.—Experiments on the degree of infestation of *Thrips tabaci* upon cotton plants under glasshouse conditions suggest that the infestation factor, or number of thrips stages per 100 sq. cm. of foliage surface, varies inversely with the weight of water supplied. Plants receiving excessive water supply have a lower infestation factor and a lower number of thrips stages per leaf as compared with plants receiving sufficiency of water supply; plants receiving insufficient water supply have a greater infestation factor than plants receiving sufficiency of water supply, but not necessarily a greater number of thrips stages per leaf; owing to their smaller foliage area, however, they suffer more from thrips attack. Irrigation is more effective in influencing the degree of thrips infestation than is rainfall. Irrigation on a flat soil surface is more effective than irrigation on a furrowed soil surface. The effect of excessive water supply does not appear to be due to mechanical removal of thrips stages from the foliage, nor to an injurious effect of soil moisture upon thrips stages or atmospheric moisture, nor to an alteration of the osmotic concentration of cell sap, although all three factors may operate slightly. It is suggested that one factor concerned is the influence of heavy water supply upon the texture of certain soils, promoting surface caking which will act inimically to soil pupating species of Thysanoptera.

II. *The relation between temperature and life cycle in a saturated atmosphere*, E. I. MacGill.—The life-cycle of *T. tabaci* from oviposition to imaginal emergence on cotton plants, under conditions of temperature varying between a mean maximum of 28.7° C. and a mean minimum of 11.25° and of relative humidity varying between a mean maximum of 92.4 per cent and a mean minimum of 74.7 per cent, has a duration of 23 to 31 days, comprising an egg stage of 8 days, two larval stages with a combined duration of 10 to 14 days, a prepupal stage of 1 to 2 days, and a pupal stage of 4 to 7 days.

III. *The relation between feeding habits and plant lesions*, R. A. Wardle and R. Simpson.—The authors' observations and experiments with *T. tabaci* on cotton and other plants suggest that plant injury from thrips attack is in this

case due entirely to premature and excessive defoliation, and is dependent in extent and severity upon the value of the infestation factor, or number of thrips stages per unit of area of foliage surface. Differences between plant species, plant varieties, and plant individuals as regards susceptibility to injury arise chiefly through variations in thickness of the epidermal cell layer. The insect does not puncture or rasp the epidermis but gashes an epidermal cell by pickax-like movements of the single mandible, induced by a slight rocking movement of the head. In most cases, the mandible can only gash the outer epidermal wall, the inner wall and the lateral walls of the mesophyll cells being broken down by similar movements of the longer protruded maxillary laciniae. There is no evidence of attack through the stomata. Suction of the chloroplasts into the pharynx is aided probably by the partial vacuum established within the mouth cone when applied closely to the leaf surface.

The preference shown by thrips stages for the lower surfaces of leaves is believed to be due rather to differences in thickness of epidermis between the lower surface and the upper surface than to negative phototropism. In plants where such differences are slight, such as cotton plants, thrips stages readily invade the upper leaf surface. On *Cajanus indicus* the upper surface is more favored, the lower surface being unsuitable owing to the close spacing of numerous fine hairs. The more widely spaced hairs on cotton leaves do not act as a deterrent, the hairy American and Indian varieties being more heavily attacked than the smoother leaved Egyptian varieties of cotton.

A blood sucking thrips, J. D. HOOP (*Entomologist*, 60 (1927), No. 772, p. 201).—The blood-sucking thrips reported from the British West Indies by C. B. Williams² has been identified by the author as *Karnyothrips flavipes* (Jones). It is pointed out, however, that this may be the same insect as *Phloeothrips lucasseni* Krüger, described from Java.

A systematic, biological, and ecological study of the Hemiptera of Delaware, H. L. DOZIER (*Delaware Sta. Bul.* 152 (1927), pp. 23-25).—Brief reference is made to studies of *Typhlocyba rosae* in apple orchards; red saddle-backed leafhopper (*Erythroneura harti*), which in some seasons becomes fairly abundant in apple orchards; pear psylla; San Jose scale; terrapin scale; and oyster-shell scale. It was found that heavy continuous rains do not have a very great influence in killing *T. rosae*, being far less effective than in the case of plant lice. In control work with the terrapin scale it was found that the full effect of oil applications can not be checked properly within three weeks. The application of Volck heavy oil emulsion on April 15, a clear sunny but very cold day, at a dilution of 1 part to 32 parts of water, gave, on April 26, 73.8 per cent actual kill against 17.4 per cent on the check block. A second count made in the same block on May 6 showed that the kill had increased to 89.9 per cent actual dead and 18.5 per cent natural mortality.

General catalogue of the Hemiptera—I, Membracidae, W. D. FUNKHOUSER (*Northampton, Mass.: Smith Col.*, 1927, pp. [13]+581).—This first part of the catalogue of Hemiptera, of which G. Horváth is general editor, includes the synonymy and geographical distribution of the Membracidae recognized. A bibliography of 33 pages and an index to genera and species are included.

Bionomics and control of the grape leaf hopper, H. L. DOZIER (*Delaware Sta. Bul.* 152 (1927), p. 23).—The increase of *Erythroneura comes* was so rapid that the foliage of many vineyards looked completely scorched in spite of the efforts of the owners to control it by spraying and dusting, thorough dusting having been prevented by the breeze which seemed to be always present in the

² *Entomologist*, 54 (1921), No. 698, pp. 163, 164.

vineyards. In experiments with the new oleoresin-pyrethrum-soap spray against the apple leafhopper *Typhlocyba rosae*, a dilution of 1 part to 50 parts of water killed all nymphs and adults hit. A dilution of 1:100 was found to give satisfactory commercial control. An application a few days later against the grape leafhopper gave negative results. Large numbers of the hoppers were killed by *Entomophthora sphaerosperma*, due to conditions favorable to its development in September and October. Brief reference is made to life history and field observations of the pest.

A comparative study of the feeding methods of certain Hemiptera and of the resulting effects upon the plant tissue, with special reference to the potato plant, K. M. SMITH (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 109-139, pls. 4, figs. 10).—This is a comparative study made of the feeding methods of the capsids *Calocoris bipunctatus* Fab. and *Lygus pabulinus* L., the leafhoppers *Eupteryx auratus* Liv. and *Zygina pallidifrons* Edw., the greenhouse whitefly, the green peach aphid, *Macrosiphum solanifolii* Ashm., and *Myzus circumflexus* Buckt., and the cecids *Aspidiotus hederæ* Vallot. and *Dactylopius longispinus* Targ-Tozz. These, with the exception of *A. hederæ*, were studied chiefly in relation to the potato plant.

Studies on the aetiology of sugar-cane froghopper blight in Trinidad.—I, Introduction and general survey, C. L. WITHERCOMBE (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 64-108, figs. 4).—In this paper the author considers the conditions influencing resistance of cane to and recovery from attack. The bionomics of the froghopper, *Monocphora (Tomaspis) saccharina* Dist., are briefly dealt with. A list of 31 references to the literature is included.

Biological studies of *Aphis rumicis* Linn.—Factors affecting the infestation of *Vicia faba* with *Aphis rumicis*, J. DAVIDSON (*Ann. Appl. Biol.*, 12 (1925), No. 4, pp. 472-507, figs. 5).—This is a detailed report upon investigations conducted from 1921 to 1924. A technique was developed whereby the influence of various factors such as temperature, manurial treatment, soil conditions, and age and variety of the plant on the infestation of beans by *A. rumicis* can be tested. See also previous notes (E. S. R., 47, p. 850; 49, p. 153).

Control of the coconut caterpillar (*Nephantis serinopa*) by its parasites, Y. RAMACHANDRA RAO (*Agr. Jour. India*, 21 (1926), No. 6, pp. 452-459, pl. 1, figs. 6; *abs. in Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), pp. 30, 31).—This is an account of the parasitism of a fairly common pest of various palms in south India, an outbreak of which took place in Mangalore in 1921, the first to be recorded on the west coast north of Cochin. The parasite complex in Cochin was found to be somewhat different from that occurring in places on the east coast, and to be more like that reported by Hutson on the west coast of Ceylon (E. S. R., 50, p. 556).

The larger sod webworm, G. G. AINSLIE (*U. S. Dept. Agr., Tech. Bul.* 31 (1927), pp. 18, figs. 2).—This is a report of studies of *Crambus trisectus* Walk., which is widely distributed in the northern part of the United States and in southern Canada, and a source of injury to native grasses. There are two generations of this crambid each year, the larvae hibernating among the grass roots, sealed up in tight little silk cocoons. "They come out and feed ravenously through April and May, and the moths appear in May and early June. The second generation of moths appears in mid-August. Corn is attacked by the overwintering caterpillars soon after it appears above ground. The larvae of the second generation are most injurious to grass and pasture lands in July, especially in dry seasons, when the grass is unable to recover quickly. The larvae resulting from the second generation of moths only partially complete their growth in the fall and do little or no damage at that season. The pest

is held in check naturally by insect enemies and fungus diseases. When once present in a field it can be controlled with difficulty, and measures used against it should be preventive rather than remedial. Such measures are crop rotation, ample fertilization, and, in the case of sod land intended for corn the following year, early fall plowing."

Value of plowing for controlling borer tested, C. B. DIBBLE (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 58, 59, fig. 1).—In this account reference is made to an investigation of the value of plowing infested fields with heavy and light soil for the control of the European corn borer, 30 cages having been placed in 6 groups of 5 each in plowed fields that had produced highly infested corn. In the areas used the surface débris had been hand picked immediately after plowing, the cages being placed on the fields in from 10 days to 3 weeks thereafter at the time when pupation was just under way. Observations were made either daily or on alternate days from June 20 or 21 until the moths were through flying on August 1. In no case during the 40 days in which the cages were under observation were corn borer moths discovered, indicating that plowing is an effective means of destroying borers.

Bionomics and control of the codling moth [and oriental peach moth]. H. L. DOZIER (*Delaware Sta. Bul.* 152 (1927), pp. 19-23).—The codling moth problem continued to be the major work in the department of entomology (E. S. R., 56, p. 356). A remarkable reduction in infestation on one property of nearly 400 acres of apples of from 91 per cent in the fall of 1925 to less than 20 per cent stung or wormy fruit in 1926 was accomplished through packing house and basket sanitation, coupled with a continuous spray program and the scraping of rough bark from 1,500 old trees surrounding the packing house.

Further studies were made of infestation in the apple by the oriental peach moth, large quantities of wormy late apples being obtained from various representative commercial properties in the Dover section. These were placed in screen cages and carried over the winter in the outdoor insectary, from which 64 codling moths and 28 oriental peach moths emerged.

In oviposition observations in one orchard heavy egg deposition by the codling moth was observed from July 1 to 12. Of 44 eggs observed, 13 were parasitized by *Trichogramma minutum* Riley. On branches collected on July 12 it was found that a much larger percentage of the eggs had been deposited on the upper surface of the leaves. The spring of 1926 was cold and long drawn out, resulting in the second generation of moths starting to issue by July 22 while the first spring brood moths were still ovipositing. Full-grown larvae of the second generation began to leave the fruit for cocooning as early as September 4, and by October 13 practically all had cocooned. A small percentage of the oriental peach moth larvae collected from apples as late as August 29 produced adult moths September 7, while some larvae leaving the fruit as late as September 8 cocooned immediately, pupated in a few days, and issued as adults by September 20 to produce a partial very late brood. Overwintering larvae examined beneath bands on one tree next to the packing house on April 5, 1927, resulted in the collection of 28 living and 12 dead larvae, the mortality having been caused by the fungus *Beauveria* (*Sporotrichum*) *globulifera*. In observations in the insectary and of old baskets and beneath bark at Newark, the overwintering larvae first began to show spring activity by starting to construct their emergence tubes on April 1 in 1927.

Examination of 75 old picking baskets stored in a loft near Camden on April 20 resulted in the finding of 40 worms and 1 pupa, the pupa apparently being that of the oriental peach moth. The earliest pupations were noted at Newark on May 10, from which the adults issued on May 31. Large numbers pupated June 7 and issued from June 16 to 27.

Overwintering larvae of the oriental peach moth from late apples carried over under the same conditions produced adults considerably earlier than did those of the codling moth. The larvae of the oriental peach moth started pupation in the insectary at Newark as early as April 25 and issued as early as May 16. From badly infested quinces, collected in the station orchard and wintered over in the insectary, the adults issued from May 10 to 12. A table is given recording the collection of oriental peach moth larvae from apples on unsprayed trees at Newark.

It is pointed out that the codling moth does not oviposit until the temperature reaches 60° F. or above at dusk, and that such temperature conditions were rare in 1927. Packing-house conditions and moth emergence were again kept under observation and are reported upon. Every effort was again concentrated on the control of the first brood by timely and thorough calyx and first-cover applications. Brief reference is made to the use of two new stickers and spreaders.

Breeding cages are solving codling moth problem, L. HASEMAN (*Missouri Sta. Circ. 161* (1927), pp. 4).—The author reports that the timing of the first brood by observations of emergence in breeding cages in six localities helped to solve the codling moth control problem.

Parasites of the pink bollworm in Hawaii, H. F. WILLARD (*U. S. Dept. Agr., Tech. Bul. 19* (1927), pp. 16, figs. 6).—This is a report of observations on parasitic enemies of the pink bollworm, presented in part in tabular form. The pink bollworm was found to be attacked in Hawaii by seven species of parasites, as follows: *Chelonus blackburni* Cameron, *Microbracon mellitor* Say (*M. pembertonii* Bridwell), *Pimpla hawaiiensis* Cameron, *Pristomerus hawaiiensis* Ashm., *Peristenerola emigrata* Rohwer, *Chalcis obscurata* Walk., and *Stomatocera peritorvus* Gir. Each of these has been reared from several other species of moths in Hawaii, while *P. hawaiiensis* and *C. obscurata* have been reared from 10 and 13 different hosts, respectively. The diversity is said to be largely responsible for the low degree of control exerted by these parasites. Only 8.42 per cent of 12,985 caterpillars under observation during 1918 and 1919 were parasitized by the combined efforts of the seven species.

"*M. mellitor* is considered the most effective parasite of the pink bollworm under Hawaiian conditions, because of its general distribution throughout the area under observation and various factors in its biology. The adult is hardy and able to maintain itself under adverse conditions, and its capacity for oviposition is good. One female deposited 213 eggs before death. The maximum period from the oviposition of the egg to emergence of the adult was 16 days.

"Mating of *P. emigrata* was observed to occur only within the cocoon of the female. The adult female is capable of ovipositing throughout her lifetime, and one female deposited 236 eggs. Parthenogenetic reproduction was observed with this species, but only males were produced. From 1,413 unfertilized eggs under observation, 1,198 males and no females were reared."

On the structure, life-history, economic importance, and distribution of the cocksfoot moth, *Glyphipteryx fischeriella* Zell., R. L. CHOPRA (*Ann. Appl. Biol.*, 12 (1925), No. 3, pp. 359-397, figs. 25).—This is an extended account of the life history, habits, economic importance of, and control measures for a microlepidopteran the larvae of which attack and damage the seed of cocksfoot or orchard grass. The kernel of each seed attacked is completely consumed, the damage being readily noticeable from the small circular holes cut. Samples of seeds obtained showed the pest to be generally distributed in England, Scotland, and Wales. It is effectively protected within the seed

against parasites. Exposure in an air-tight chamber at a temperature of 60° C. (140° F.) for 24 hours was found to be fatal to the larvae.

An illustrated key to the identification of the anopheline larvae of India, Ceylon, and Malaya, C. STRICKLAND and K. L. CHOUDHURY (*Calcutta: Thacker, Spink & Co., 1927, pp. XI+67, pls. 12*).—Chapter 1 of this work (pp. 1-8) deals with the collection of anopheline larvae, and chapter 2 (pp. 9-52) with how to make the best use of the field collections, including an illustrated key for the identification of the larvae (pp. 20-51). Four appendixes are included which deal with catching adults, equipment required, staff required, and packing specimens for posting. Appendix 5-A gives the recorded geographical distribution of the species and 5-B the commoner habitats of the species as larvae. A list of 41 references to the literature is included.

On *Chlorops taeniopus* Meig. (the gout fly of barley), J. G. H. FREW (*Ann. Appl. Biol., 11 (1924), No. 2, pp. 175-219, pls. 2, figs. 4*).—This pest was found to pass through two generations each year. The winter generation is found mainly upon couch grass but also occasionally upon winter wheat or barley or upon self-sown wheat or barley. The summer generation occurs mainly upon spring barley, but in seasons unfavorable to the fly upon couch grass. Very rarely wheat is a summer host plant. The life history is described in detail, and preventive measures are suggested, including early sowing or spring barley, good cultural conditions of the soil, and manuring to stimulate early growth.

Flies commonly found in dwellings, E. McDANIEL (*Michigan Sta. Circ. [106] (1927), pp. 15, fig. 1*).—This is a practical summary of information on the flies commonly met with in houses and the means for their control.

Onion and bulb crops' pest appears in State, E. McDANIEL (*Michigan Sta. Quart. Bul., 10 (1927), No. 2, pp. 48-52, figs. 3*).—Attention is called to the fact that the lesser bulb fly made its appearance in Michigan for the first time in 1927. In addition to the narcissus bulb, which is its preference as a breeding place, it attacks hyacinths, onions, potatoes, parsnips, and iris roots. An account is given of the appearance of the insect, the detection of infected bulbs, and control measures.

Controlling horn and stable flies, L. HASEMAN (*Missouri Sta. Bul. 254 (1927), pp. 10*).—Following a brief introduction, an account is given of the distribution of these flies, their life cycle is referred to, methods of control are discussed, and formulas for killing and repellent sprays that have been found most effective are given. Tests made of commercial fly salt, data on which are presented in tabular form, showed that it had no effect in reducing the number of flies on the cows to which it was fed. Observations of the effect of color revealed the fact that about 50 per cent more horn flies were counted on dark-colored than on light-colored cows, but that there were slightly more stable flies feeding on the light-colored cows.

Supplement to Smith's 1909 Diptera list, H. C. HALLOCK and L. B. PARKER (*N. J. Dept. Agr. Circ. 103 (1926), pp. 20*).—This list supplements that given in *The Insects of New Jersey* (E. S. R., 25, p. 250.)

A study of *Hylemyia* (Chortophila) brassicae Bouché, the cabbage root fly, and its parasites, with notes on some other dipterous pests of Cruciferous plants, K. M. SMITH (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 312-330, pl. 1, figs. 10*).—A detailed account is first given of the life history and habits of the cabbage maggot, followed by descriptions of its parasitic and predacious enemies, including the larvae of the staphylinid beetle *Aleochara bilineata* Gyll., the cynipid *Oothonaspis rapae* Westw., the braconid *Daenusa stramineipes* Halld., and the anthomyid *Phaonia trimaculata* Bouché, the larvae

of which are carnivorous and feed upon the cabbage maggot larvae. There are also described a proctotrupid, *Exallonyx ligatus* Nees., which is parasitic upon the larva of *A. billineata*, and the tuchinid *Onesia agilis* Meig., which is associated with *H. brassicae*, although the exact relationship has not been determined.

Studies on *Oscinella frit* Linn. (*Ann. Appl. Biol.*, 12 (1925), No. 4, pp. 508-515; pp. 516-526, figs. 5; pp. 526, 528, fig. 1).—The studies reported are as follows: Supplementary Data on the Relation between Varietal Differences of Oat Plants and Susceptibility to Infestation, by N. Cunliffe and J. C. F. Fryer; The Correlation between Stage of Growth of Stem and Susceptibility to Infestation, by N. Cunliffe, J. C. F. Fryer, and G. W. Gibson; and A Note on the Seasonal Regularity of the Maximum Prevalence Periods of the Fly in the Field, by N. Cunliffe.

***Tyroglyphus muscae*, a mite infesting *Sturmia sericariae*, a fly noxious to the silkworm.** C. SASAKI (*Jour. Col. Agr., Imp. Univ. Tokyo*, 9 (1927), No. 3, pp. 151-158, pl. 1).—This is a report of experimental work on the direct parasitism of the tachinid by *T. muscae*, a mite previously described by the author.*

The action of some organic compounds upon the cucumber-house woodlouse. E. R. SPEYER and O. OWEN (*Ann. Appl. Biol.*, 11 (1924), No. 2, pp. 236-243, fig. 1).—This is a report of compounds tested with a view to winter control of *Armadillidium speyeri* Jackson. Phenol and the cresols were the most active compounds tested. Naphthalene ceases to act in the soil on the fourth day after mixing.

Studies on the carrion beetles of Minnesota, including new species. M. H. HATCH (*Minnesota Sta. Tech. Bul.* 48 (1927), pp. 19).—In this account the author first discusses the Silphinae of Minnesota, giving keys for the separation of the adults and larvae of the species. In the catalogue which follows 16 species and 1 new variety are recognized. This is followed by an inquiry into the position of the Silphinae in the staphylinoid series, including a table in which an attempt has been made to arrange the groups in a natural sequence. The concluding part consists of notes on Catopidae and Anisotomidae, with a key to the genera of Catopinae and a key to the larvae of Catopidae and Anisotomidae. Two species, *Anogdus luggeri* and *Hydnobius luggeri*, are described as new.

Proper rotations limit white grub damage. R. H. PETTIT (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 40, 41).—In this account the author calls attention to the fact that those sections which suffered damage from white grubs in 1927 will probably again suffer from infestation in 1930, and emphasizes the importance of rotation as a control measure.

Leaf-beetles of the genus *Galerucella* known to inhabit New Jersey. A. J. MUTCHLER and H. B. WEISS (*N. J. Dept. Agr. Circ.* 93 (1926), pp. 16, figs. 2).—The species of the genus occurring in New Jersey are reported upon, a table for their separation being included.

Investigations on the control of wireworms. H. W. MILES and F. R. PETHERBRIDGE (*Ann. Appl. Biol.*, 14 (1927), No. 3, pp. 359-387, pls. 2, figs. 2).—Calcium cyanide in granular form was found highly toxic to wireworms when used in connection with baiting at the rate of 2 to 3 lbs. per 100 yds. of bait row, destroying 75 to 100 per cent of the wireworms assembled. Examination of weeds growing in infested fields indicated that wireworms are found in numbers at the root of some plants such as couch grass (*Agropyrum repens*) and yarrow (*Achillea millefolium*), while very few occur at the roots of plants like chickweed (*Stellaria media*), goutweed (*Chenopodium album*), and annual nettle (*Urtica urens*). Field observations on the movements of wireworms

* *Seric. Expt. Sta. [Japan] Rpt.*, 5 (1921), pt. 6. (In Japanese.)

in the soil throughout the autumn, winter, and spring indicated that there is a definite downward migration in autumn and upward migration in spring. Correspondingly, wireworm activity in the surface soil was noted to be at its height in September and October and March, April, and May.

A supposedly new baridid weevil from Peruvian sugarcane, H. S. BARBER (*Ent. Soc. Wash. Proc.*, 29 (1927), No. 7, pp. 149, 150, fig. 1).—Under the name *Eumycterus? saccharidis* n. sp. the author describes a small weevil injurious to sugar cane at Pomalca, near Chiclayo, Peru, by attacking the heart of the terminal shoot.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals.—VII, Equivalence of age during the self-inhibiting phase of growth, S. BRODY (*Missouri Sta. Research Bul.* 102 (1927), pp. 47, figs. 26).—In continuing the work noted in Bulletin 101 (*E. S. R.*, 58, p. 352) on the self-inhibiting phase of growth, a study was made of the equivalence of age during this period.

It was found that with different breeds of rabbits differing in mature weight by over 100 per cent they may all reach maturity at exactly the same age. On the other hand, different groups of the same breed of albino rats having nearly the same mature weight may vary by over 100 per cent in respect to the time at which they reach mature weight. In the pigeon the major inflection (puberty) of the growth curve occurs relatively early in life, and it approaches mature weight more rapidly than any other animal examined.

This work shows an essential similarity in the shape of the growth curves of multicellular animals and plants. Equivalence charts between growth curves of plants, population, and animals are also presented.

Studies in animal nutrition.—VI, The distribution of the mineral elements in the animal body as influenced by age and condition, A. G. HOGAN and J. L. NIERMAN (*Missouri Sta. Research Bul.* 107 (1927), pp. 45, figs. 6).—Continuing this series of studies (*E. S. R.*, 50, p. 868; 51, p. 170), complete mineral analyses, including sodium, potassium, calcium, magnesium, iron, phosphorus, chlorine, and sulfur, were made of 15 newly born calves and of 18 steers, ranging in age from birth to 4 years old. The dams of the newly born calves had been on high, medium, and low planes of nutrition, and the steers were from groups on similar planes of nutrition.

The ash content of the entire bodies of calves, even of abnormal animals, did not vary much, averaging 4.5 per cent. On a fat-free basis the mineral content of the entire body was quite constant and could not be correlated with the condition of the dam. The ash of the corresponding samples of the steers for lean and fat, hide and hair, internal organs, blood, and skeleton was practically constant. Age and condition apparently did not affect the mineral content of the lean and fat or of the hide and hair. The mineral content of the internal organs had a decided tendency to decrease with age. The sodium, and possibly the chlorine, of the blood tended to decrease with age. In the skeleton, calcium, phosphorus, and magnesium increased in percentage with age, being the only elements where marked variations were noted.

A series of tables giving detailed analyses is appended.

The influence of mineral matter upon growth and reproduction, W. D. SALMON (*Alabama Sta. Rpt.* 1924, pp. 10, 11).—A ration of 2 parts of yellow corn and 1 part of peanut meal produced little growth with albino rats, but when 1 per cent of salt was added slight gains were made for two or three months. Beading on the ribs of the animals on these rations showed the

presence of rickets. Calcium carbonate or bone meal added in addition to salt in the diet supported normal growth, but when acid phosphate was used the growth rate was slightly below normal. No young were produced by females on the basal ration or the basal ration plus salt. Bone meal and salt resulted in large litters of young to the fourth generation. With salt and calcium carbonate a second generation was produced, but the third generation was a failure. Females fed salt and acid phosphate produced young but none were raised, these young being weak and low in vitality and usually dying in a few days.

Factors which influence the quality and palatability of meat, E. A. TROWBRIDGE, A. G. HOGAN, ET AL. (*Missouri Sta. Bul.* 256 (1927), pp. 55-62, figs. 2).—Continuing this work (E. S. R., 57, p. 459), the results obtained with calves approximately 40 lbs. lighter, on rations of shelled corn 8 parts and cottonseed meal 1 part in addition to alfalfa hay and corn silage were practically identical with those previously noted.

At the Sni-a-Bar Farm heifer calves fed grain in a creep while nursing ate less feed and made somewhat smaller gains than steers but were fatter and sold at 50 to 75 cts. more per hundredweight than steers at weaning time. All calves made economical gains when full fed for 6 months after weaning, but those that had received grain while nursing had attained a higher finish at this time. Calves sired by grade bulls were valued at \$2 per hundredweight less than those sired by purebred bulls. Fall steer calves fed grain while running with their dams showed greater net returns than those which had no grain. They weighed approximately 100 lbs. more per head and were fat enough for slaughter when weaned at 8 months of age.

The carcass of a 9-year-old half-fat steer produced a slightly higher percentage of fore quarter than did the carcass of a 12-month-old fat calf. The immature carcass yielded a higher percentage of round, loin, and fore shank. There was 5.55 per cent more lean, 6.93 per cent less fat, and 1.38 per cent more bone in the fore quarter of the mature steer. In the hind quarter of the immature carcass there was 4.43 per cent more lean, 3.26 per cent less fat, and 1.18 per cent less bone. In the immature carcass the neck contained the highest percentage of lean, followed in order by round and loin. The plate of the immature carcass carried much more fat than the same piece from the mature carcass. The loin of the immature carcass had 1.7 per cent less lean, 5.26 per cent more fat, and 5.56 per cent less bone than that of the mature carcass. The ribs of the mature carcass carried less fat and more bone than the ribs of the immature carcass. Chemical analyses showed a higher moisture and protein content for the immature carcass and a higher fat content for the mature carcass. Physical analyses showed a higher percentage of separable fat in the younger carcass, indicating more dispersion of fat among the lean tissues in the mature carcass.

The carcasses of a steer and a heifer, each 14 months old and full fed for 168 days, were compared. The heifer carcass carried more fat and graded higher than the steer carcass. The eye of beef was slightly smaller and the amount of fat on the rib cut greater in the heifer carcass. Steers similar to the above but half fed grain and roughage or fed silage and hay for the same period showed in the rib cut a protein content about 4 per cent higher and about 20 per cent more water than the same cut of the full-fed steer.

Steer feeding experiments and actuary, G. S. TEMPLETON and C. J. GOODALL (*Mississippi Sta. Bul.* 243 (1927), pp. 29, figs. 9).—Part 1 of this bulletin summarizes the results of work previously noted (E. S. R., 53, p. 64). Averaging four years' work, 3 lots of steers were fed for an average of 114 days. The

average daily gains per head in the lots receiving the basal ration, the small amount of molasses, and the medium amount of molasses were 2.28, 2.43, and 2.49 lbs., respectively. The returns per steer above initial valuation and feed cost averaged highest in the lot receiving the small amount of molasses, and were followed in order by the lots receiving the basal ration and medium amounts of molasses.

Part 2 is a series of tables estimating the selling price of steers on the farm necessary to break even on the feeding operation. The tables are for different systems of feeding and feeds and cattle at varying prices, and the figures are usually based on results of feeding experiments at the station.

Fattening steers on dry-land crops of the Southwest. W. H. BLACK, J. L. LANTOW, and D. R. BURNHAM (*U. S. Dept. Agr., Tech. Bul. 30 (1927), pp. 15, figs. 3*).—This is another account of work previously noted from the New Mexico Experiment Station (*E. S. R.*, 57, p. 681).

Winter steer feeding, 1924-25. J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 314 (1927), pp. 14*).—Continuing the steer feeding experiments (*E. S. R.*, 53, p. 465), 6 lots of 10 and 1 lot of 9 aged steers each were fed for 160 days, using methods practically identical with those conducted during 1923-24, and with results summarized as follows:

Summary of Indiana 1924-25 winter steer feeding trials

Lot	Average initial weight	Average daily gain	Feed consumed per pound of gain							Necessary selling price per 100 lbs.	Pork produced ¹
			Shelled corn	Cottonseed meal	Soybean oil meal	Whole soy beans	Corn silage	Clover hay	Soybean hay		
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
1.....	972	2.36	4.91	-----	1.06	-----	13.48	1.25	-----	\$10.03	690
2.....	961	2.36	4.02	-----	-----	1.05	12.73	1.17	-----	9.84	828
3 ¹	959	2.38	4.86	-----	-----	1.04	12.59	1.23	-----	9.86	925
4.....	965	2.35	4.93	1.06	-----	-----	13.71	1.28	-----	10.02	680
5.....	962	2.38	5.94	1.04	-----	-----	.53	-----	5.65	10.24	722
6.....	955	2.53	4.62	.98	-----	-----	12.30	-----	1.52	9.97	619
7.....	962	2.02	6.12	-----	-----	-----	15.96	1.57	-----	9.85	565

¹ Salt given other lots supplemented with a mineral mixture of acid phosphate, wood ashes, and salt.

² A small quantity of corn fed to the hogs in each lot.

The results are discussed as a comparison between cottonseed meal, soy bean oil meal, whole soy beans, and whole soy beans plus mineral mixture, the value of cottonseed meal in rations containing silage for fattening cattle, and a comparison of soy bean hay and clover hay in the above rations.

Wintering beef cattle in the Appalachian region. W. H. BLACK (*U. S. Dept. Agr., Dept. Circ. 408 (1927), pp. 12, figs. 6*).—The results of wintering beef cows (*E. S. R.*, 58, p. 770), calves, yearlings, and 2-year-old steers are discussed.

An average of 3 years' work with the calves showed with a ration of corn silage, rye hay, and cottonseed meal an average winter gain of 55 lbs. each. These calves gained 193 lbs. each on summer pasture. Calves on corn silage and clover hay gained 46 lbs. each during the winter and 192 lbs. while on pasture. Mixed hay and a grain mixture resulted in winter gains of 98 lbs. and pasture gains of 182 lbs. The total feed cost per head was \$18.54, \$17.08, and \$25, respectively.

Four years' experiments with yearling steers on a ration of corn silage, mixed hay, and wheat straw showed a winter loss of 1 lb. per head and a pasture gain of 317 lbs. each. On corn silage, wheat straw, and cottonseed meal there were 62 lbs. winter gain per steer and pasture gains of 262 lbs. On

a ration of mixed hay and wheat straw steers lost 35 lbs. per head during the winter, but they gained 309 lbs. on pasture. One years' results with rations of corn silage and soy bean hay and corn silage, rye hay, and cottonseed meal gave winter gains of 27 and 11 lbs. and pasture gains of 240 and 281 lbs., respectively. The total feed cost per head in the respective lots was \$22.69, \$22.22, \$23.57, \$21.76, and \$23.82.

An average of 3 years' experiments with 2-year-old steers showed with a ration of mixed hay and ear corn a winter gain of 18 lbs. per head and a pasture gain of 312 lbs. Steers fed 28.9 lbs. of silage per head per day lost 9 lbs. per head during the winter and gained 346 lbs. on pasture. A larger allowance of silage produced 66 lbs. winter gain and 233 lbs. pasture gain. Corn silage and cottonseed meal resulted in winter gains of 50 lbs. and pasture gains of 312 lbs., a ration of corn silage, wheat straw, and cottonseed meal in 84 lbs. winter gain and 258 lbs. pasture gain and corn silage and mixed hay in 59 lbs. of winter gain and 277 lbs. gain on pasture. The total feed cost per head in the respective lots was \$36.38, \$24.28, \$27.90, \$29.12, \$28.35, and \$30.91.

Method of wintering pregnant ewes and fattening their lambs for early market: Creep feeding lambs, E. A. TROWBRIDGE and M. T. FOSTER (*Missouri Sta. Bul.* 256 (1927), p. 46).—A study of the daily weights of lambs from birth to 1 week of age, weekly weights to 4 months of age, and monthly weights thereafter showed that lambs grow most rapidly the first few weeks after birth. There appears to be a second growth period which reaches its maximum at about 12 months for Shropshires and Southdowns and 17 months for Hampshires. Early lambs grew better during the summer months than late lambs.

Sheep production in Kansas, H. E. REED (*Kansas Sta. Bul.* 240 (1927), pp. 76, figs. 40).—A popular publication divided into the following sections: The development of the sheep industry in the United States and Kansas, types and breeds of sheep, the farm flock, pastures for sheep, shelter and equipment for sheep, and feeding western lambs for market.

[Experiments with swine at the Alabama Station] (*Alabama Sta. Rpt.* 1924, pp. 9, 10, 13).—The results of three experiments are noted.

Peanut meal with supplementary feeds for hogs, W. D. SALMON.—Continuing this study (*E. S. R.*, 52, p. 472), five lots of 12 pigs each, averaging 79 lbs., were fed for 68 days on a basal ration of 5 parts of ground corn and 1 part of peanut meal. The ration was supplemented with the following minerals: Lot 1 none; lot 2 charcoal 1 lb., marble dust 1 lb., and salt 1 lb.; lot 3 marble dust 2 lbs., acid phosphate 1 lb., and salt 1 lb.; lot 4 marble dust 2 lbs., bone meal 1 lb., and salt 1 lb.; and lot 5 marble dust 2 lbs., bone meal 2 lbs., salt 1 lb., and tankage 1 lb. The average daily gains in the respective lots were 1.07, 1.79, 1.68, 1.7, and 1.71 lbs. The lots receiving minerals made an average of 60.7 per cent larger gains on 8.2 per cent less feed per unit of gain than those receiving no minerals. All carcasses were graded commercially hard.

Velvet bean rations for brood sows, E. R. MILLER and W. D. SALMON.—It was found that sows fed velvet beans or velvet beans supplemented with minerals farrowed undersized pigs of low vitality which died within a few days. The sows generally had little or no milk. When changed to normal rations sows farrowed normal pigs. Feeding sows for 100 days on velvet beans plus minerals and then changing to a normal ration produced pigs somewhat below normal. Feeding the velvet beans for 75 days gave better results, but adding alfalfa meal to the ration during this period showed no improvement. Cod-liver oil added to the velvet bean ration caused a slight improvement in the vitality of the pigs farrowed, but no pigs were raised. Cod-liver oil and yeast

added to the ration produced a litter of 10 pigs, 6 of which averaged 20.6 lbs. at 8 weeks of age. A ration of 45 per cent of velvet beans, 50 per cent of corn, 5 per cent of tankage, and minerals produced normal litters, which, however, did not develop well. Fair results were obtained with a ration of 25 per cent of velvet beans and 75 per cent of a mixture of corn, shorts, tankage, alfalfa meal, and minerals.

Velvet beans in the ration for pigs, E. R. Miller and W. D. Salmon.—Twenty-five per cent of raw velvet beans in the ration for weanling pigs was found to barely maintain the weight of the animals. Cooking the beans caused a marked improvement in the ration.

[Experiments with swine at the Delaware Station], A. E. TOMHAVE (*Delaware Sta. Bul.* 152 (1927), pp. 12, 13, 14).—The results of three experiments in continuation of work previously noted (E. S. R., 56, p. 369) are reported.

Winter rations for brood sows.—Two groups of 8 sows each were fed from December 14 to March 1 on a ration of ear corn and a grain mixture of ground oats, hominy, middlings, bran, tankage, linseed oil meal, and salt. Lot 1 received in addition tankage to the extent of 6 per cent of the ear corn fed. Both lots had free access to alfalfa leaves and a mineral mixture. In lot 1, the average weight of the pigs at birth was 2.73 lbs., 34.4 per cent of the pigs farrowed were strong, 11.4 per cent were weak, and 11.4 per cent were dead. The corresponding results in lot 2 were 2.59 lbs., 32.6 per cent, 2.2, and 21.7 per cent, respectively.

Protein supplements for growing fattening pigs.—Five lots of 10 pigs each were fed for 104 days on rape pasture, except lot 2 which was on alfalfa pasture. The basal ration was shelled corn, and in addition lots 1 and 2 received ground soy beans, lot 3 tankage and ground soy beans, lot 4 tankage, and lot 5 no supplement. The average daily gains in the respective lots were 0.67, 1.13, 1.14, 1.07, and 0.67 lbs. Lot 2 made the most economical gains, followed in order by lots 4, 3, 1, and 5.

Three lots of 10 pigs each were self-fed in dry lot for 95 days on a basal ration of shelled corn. In addition lot 1 received ground soy beans, lot 2 ground soy beans 75 per cent and alfalfa leaf meal 25 per cent, and lot 3 ground soy beans 50 per cent, alfalfa leaf meal 25 per cent, and tankage 25 per cent. All pigs had free access to a mineral mixture. The gains were unsatisfactory in all lots. The addition of alfalfa leaf meal in lot 2 did not increase the gains but increased the cost of gains. The combination used in lot 3 produced the best and cheapest gains in this test.

Forage crops for swine in Delaware.—In a test of forages 3 lots of 10 pigs each were full-fed corn and tankage for 89 days, lot 1 on rape pasture, lot 2 on soy-bean pasture, and lot 3 in dry lot. Lot 3 required 418 lbs. of concentrates to produce 100 lbs. of gain. Based on this requirement, rape and soy-bean forage effected a saving of 14.13 and 73.42 lbs. of concentrates, respectively, for the same gain.

[Experiments with hogs at the Missouri Station] (*Missouri Sta. Bul.* 256 (1927), pp. 46-50, 51-55, figs. 2).—Results of several experiments are noted in continuation of work previously reported (E. S. R., 57, p. 461).

Fecundity of swine: The normal sexual cycle and as influenced by unfavorable dietary conditions, A. G. Hogan and F. F. McKenzie.—Early breeding and two litters a year production combined with restricted feeding of gilts retarded growth materially as compared with animals generously fed. This difference amounted to as much as 10 to 21 cm. in length of body, 3.5 to 6 cm. in height at withers, 3 to 7 cm. in height at croup, 6 to 15 cm. in depth of chest, and 14 to 50 cm. in heart girth. Farrowing and weaning large litters caused sows to lose

from 40 to 79 lbs. in weight during the suckling period. Small litters caused little change in weight, and when small litters were lost after farrowing the sows soon gained in weight. Losses in weight were greatest the first four weeks after farrowing. Early breeding for 18 years has not affected the ability of the later sows to wean heavy pigs. Underfeeding the first month after breeding caused sows to farrow pigs below the average in size at birth and weaning. The uterus and vagina of an 8-months-old gilt that had been underfed weighed 106 gm. as compared to 585 gm. for sows well fed.

It was found that 0.12 per cent of calcium in the ration of gilts was insufficient for normal growth and reproduction, and that 0.25 per cent was little, if any, above the minimum requirement. Bone ash as a calcium supplement did not prove satisfactory since all the sows so fed lost their litters soon after farrowing.

Rations for pigs at weaning time, L. A. Weaver.—In a study of rations for fall pigs, 9 lots of weanling pigs were fed on corn and various supplements arranged so that the nutritive ratio was 1:6 in each lot. In addition all lots were self-fed a mineral mixture. Little difference was found in the rate or economy of gain when cottonseed meal was substituted for one-fourth to one-half of the tankage in the ration. When cottonseed meal replaced more than one-half of the tankage, the rate and economy of gain was decreased. When 20 per cent of alfalfa meal replaced a like amount of tankage, it was found that 11.63 lbs. of meal saved 23.89 lbs. of corn and 3.31 lbs. of tankage in the production of 100 lbs. of gain and also increased to some extent the rate of gain. Pigs on bluegrass pasture made more rapid gains and required less concentrates per 100 lbs. of gain than those in dry lot with alfalfa meal. No difference was found in rate or economy of gain when 20 per cent of cottonseed meal or linseed meal was fed. One lb. of a supplement containing 60 per cent of protein was more efficient than 2 lbs. of a supplement containing 25 per cent of protein.

Forage crops for swine, L. A. Weaver.—In continuing the work with alfalfa pastures, the results were materially the same as those previously noted. When fed corn on rape pasture with or without protein supplement, 6 bu. of corn and 20 lbs. of tankage were required to produce 100 lbs. of gain. A little less than 7 bu. of corn was required when fed without supplement. A third lot required a little more than 6 bu. of corn and approximately 58 lbs. of pig chow for each 100 lbs. of gain.

The feeding value of raisins and dairy by-products for growing and fattening swine, E. H. HUGHES (*California Sta. Bul.* 440, (1927), pp. 12, figs. 2).—The results of five experiments conducted during 1923 and 1924 are reported, one of which has been previously noted (*E. S. R.*, 51, p. 76). These experiments have led the author to conclude that cull raisins were quite palatable as a feed for hogs and that when fed with barley and a protein supplement produced satisfactory gains, increasing slightly the feed requirements for 100 lbs. of gain. When fed in this manner they were somewhat less valuable pound for pound than rolled barley. Raisins and tankage on alfalfa pasture gave very slow gains, and pigs so fed scoured severely at times. A ration of 15 parts of rolled barley and 1 part of tankage was more efficient in the amount of feed required for 100 lbs. of gain, but produced somewhat slower gains than a ration consisting of 5 parts each of rolled barley, raisins, and rice bran and 1 part of tankage. Alfalfa pasture was an excellent supplement to this latter ration. The dairy by-products caused pigs to gain faster on less barley per 100 lbs. of gain than did tankage.

Cod liver products and ultra violet light irradiation in the production of fall pigs, J. M. EVVARD, C. C. CULBERTSON, W. E. HAMMOND, C. F. BASSETT,

and H. W. NILSON (*Iowa Sta. Leaflet 24* (1927), pp. 7).—Five lots of 6 pigs each, except lot 1 which was an average of 3 groups of 6 pigs each, were fed on varying rations for periods required to take them from an average weight of 47 to 250 lbs. each. The basal ration fed to all lots was shelled corn, tankage and minerals, all self-fed. In lot 2, 3 lbs. of sun-ried cod-liver oil was mixed with 97 lbs. of tankage, and in lot 3, 3 lbs. of steam-rendered cod-liver oil was mixed with the same amount of tankage. In lot 4 the pigs were treated for 10 minutes daily the first 90 days and 30 minutes daily thereafter at a distance of 3 ft. with a quartz mercury vapor lamp. Six lbs. of cod-liver meal was mixed with 94 lbs. of tankage in lot 5.

The number of days required to reach an average weight of 250 lbs. was 136.5, 143.5, 132.5, 137.5, and 134 days in the respective lots. The cost of feed per 100 lbs. of gain was lowest and the margin per pig over feed cost highest in lot 3. Opposite results were obtained in lot 4. Irradiating the pigs with ultra-violet light reduced the amount of feed required per unit of gain, but the irradiation cost was high enough to offset the advantage of saving in feed. Cod-liver meal cost more than it was worth nutritionally. During the early stages of feeding this feed had apparently a rather marked laxative effect, which, however, did not interfere with the pigs' ability to gain. Steam-rendered cod-liver oil was markedly superior to sun-ried oil in rate and economy of gain and in margin per pig over feed cost.

Growth in draft colts, E. A. TROWBRIDGE and D. W. CHITTENDEN (*Missouri Sta. Bul. 256* (1927), pp. 44-46, figs. 2).—Records of feeds fed, weights, and linear measurements were kept on colts after they had been put to work in the spring of 1926 (E. S. R., 57, p. 462). After starting work, both lots of colts were fed the same ration. The colts that had been full fed lost an average of 127.22 lbs. each during the first year they were worked, while the colts in the limited-fed lot lost but 25.83 lbs. Part of the loss in the full-fed group was due to two mares that foaled during the year. The colts that had received the limited feed increased 1.62 in. in height at withers during the year.

[Experiments with poultry at the Missouri Station], H. L. KEMPSTER (*Missouri Sta. Bul. 256* (1927), pp. 83-85).—The results of three experiments in continuation of work previously noted (E. S. R., 57, p. 462) are reported.

Nutritional requirements of poultry.—Two per cent of cod-liver oil was fed in the mash to 3 lots of hens. One lot was exposed to winter sunshine and the other lots were kept behind glass. Three other lots were kept under similar conditions but received no cod-liver oil. From December 10 to March 31 White Leghorns in lot 1 with sunshine and cod-liver oil produced an average of 48.1 eggs, lot 2 (White Leghorns) with sunshine and no cod-liver oil produced 40.8 eggs, lot 3 (White Rocks) receiving cod-liver oil and no sunshine produced 51.4 eggs, and lot 4 (White Rocks) with no sunshine and no cod-liver oil produced 24.5 eggs. Brown Leghorns in lot 5 with cod-liver oil and no sunshine produced 49.8 eggs, and in lot 6 with no cod-liver oil and no sunshine 21.6 eggs. The percentage of hatch of fertile eggs in the respective lots was 81.5, 80.6, 47, 33, 42, and 7.3.

Two pens of 20 chicks each were fed in a brooder on a ration composed of shorts and white corn meal 33 parts each, bran 20 parts, tankage 7 parts, bone meal 6 parts, and salt 1 part. Water and sour skim milk were available at all times, but the chicks received no sunshine. Each pen was fed one boiled egg daily, which was increased to two after the first week. In pen 1 the yolks of the eggs fed had a bright yellow color and in pen 2 an extremely pale color. In pen 1 no leg weakness appeared, while in pen 2 several chicks developed this trouble.

Value of sour milk, beef scrap, cottonseed meal, gluten meal, and oil meal in rations for egg production.—Eight lots of hens were fed a basal ration of equal parts of bran, shorts, and corn meal, to which was added 20 per cent of meat scrap, tankage, or fish meal or 30 per cent of cottonseed meal, soy bean meal, or dried buttermilk. A mineral mixture of 4 parts of bone meal and 1 part of salt was added in 1 of the 2 pens being fed vegetable proteins. The mashers containing animal proteins had 1 per cent of salt added. Oyster shell and limestone rock were available to all lots, and the scratch feed consisted of yellow corn and oats. Based on the average egg production, it was found that cottonseed meal or soy bean meal could be used to replace milk or meat only when properly supplemented with minerals.

Age as a factor in poultry breeding.—A study of 239 pullets of the heavier breeds showed a correlation between the number of winter eggs produced and hatchability of 0.364 ± 0.04 , between winter egg production and percentage of fertility of 0.17 ± 0.04 , and between percentage of fertility and percentage of hatchability of 0.2 ± 0.04 . With White Leghorns no correlation seemed to exist between the number of winter eggs and hatchability either during the first or second laying season, but there was a correlation of 0.219 ± 0.07 between hatchability of the first and second laying seasons.

[Feeding experiments with poultry at the Delaware Station], A. E. TOMHAVE and C. W. MUMFORD (*Delaware Sta. Bul. 152* (1927), pp. 14-16).—The results of two experiments are briefly reported in continuance of work previously noted (E. S. R., 56, p. 372).

Soy beans for baby chicks.—Three pens of 334 chicks each were fed the same basal ration, supplemented as follows: Lot 1 10 lbs. meat scraps and 10 lbs. dried buttermilk, lot 2 15 lbs. ground soy beans and 10 lbs. dried buttermilk, and lot 3 24 lbs. ground soy beans. One hundred and ten pullets were selected from each lot to be placed in the laying house, at which time the respective lots averaged 2.93, 2.54, and 2.05 lbs. in weight. The mortality in lot 3 was high but normal in the other lots. During the laying year the lots received the same basal ration with the following supplements: Lot 1 equal parts dried buttermilk and meat scraps, lot 2 50 lbs. dried buttermilk and 75 lbs. ground soy beans, and lot 3 120 lbs. ground soy beans. Lots 1 and 2 began laying September 1 and lot 3 October 29. During 303 days the lots laid 9,133, 7,735, and 4,844 eggs, respectively.

Ground soy beans in the ration for laying pullets.—It has been found that when 150 lbs. of ground soy beans and 50 lbs. of mineral mixture were substituted for 100 lbs. of meat scraps in a ration for laying pullets the ground soy beans were 80 per cent as efficient for egg production as the meat scraps. Ground soy beans maintained the birds in excellent physical condition, and the mortality in this lot was below the normal for those fed meat scraps. Ground soy beans were palatable and readily eaten by the birds.

Feeding for egg production, H. L. KEMPSTER (*Missouri Sta. Circ. 163* [1927], pp. 16 figs. 5).—A popular publication superseding Circular 111, previously noted (E. S. R., 49, p. 574).

A balanced and unbalanced ration fed prior to the hatching season as affecting the hatchability of eggs and the vigor of the progeny, H. ARWOOD (*West Virginia Sta. Bul. 207* (1927), pp. 10).—Two lots of May-hatched birds were each divided into 3 groups of 16 females each on November 1, 1923, and fed until September 19, 1925. Lot 1 received a mixture of whole grains for scratch feed consisting of yellow corn, wheat, and oats 2:2:1 parts. The birds were self-fed mash made of 2 parts of yellow corn meal and 1 part each of wheat bran, wheat middlings, and meat scrap. They also received a moderate allowance of semisolid buttermilk. Lot 2 was fed liberally on the

whole grain mixture until a short time before the eggs were saved for hatching, when mash and semisolid buttermilk were added to the ration. These rations were reversed the second year. A cockerel was placed with each group of hens and changed daily from one pen to another during the breeding season. Records were kept of the annual egg production, eggs incubated, the fertility and hatchability of the eggs, and the mortality and rate of growth of the chicks.

During the first year lot 1 consumed 4,089 lbs. of feed and laid 7,612 eggs, while lot 2 ate 3,460 lbs. of feed and produced 5,857 eggs. The second year lot 1 consumed 2,818 lbs. of feed and laid 4,217 eggs, while lot 2 ate 3,152 lbs. of feed and laid 5,842 eggs. The average of two hatches the first year showed that for lot 1 the percentages of eggs hatched, eggs fertile, and fertile eggs hatched were 85, 92, and 92 per cent and for lot 2, 79, 93, and 85 per cent, respectively. There was no significant difference in the weight of the chicks from the 2 lots or in the variability of the weights. The results for the second year were practically identical with those obtained the first year. This experiment shows no evidence that heavy egg production immediately prior to the hatching season has a detrimental effect on the fertility or hatchability of the eggs or on the vigor of the chicks.

Influence of time of hatch on hatchability of the eggs, rate of growth of the chicks, and characteristics of the adult females, C. W. URR and R. B. THOMPSON (*Oklahoma Sta. Bul. 167 (1927), pp. 36, figs. 5*).—In concluding this experiment (*E. S. R.*, 57, p. 507), it has been found that the optimum time for hatching chicks in Oklahoma is during the spring season. This takes into account the fertility, hatchability, and number of dead germs during the hatching season, the chick and adult mortality, and the annual egg production. Such groups grew less rapidly and reached sexual maturity at a later date than winter-hatched birds, but equaled or excelled them in all other respects.

A study of the data has indicated that the time of hatching had no influence on the average first year's egg weight of the winter-spring birds, but that the later the hatch in the summer-fall division the smaller was the average egg size for the first year's production. Birds that molted slowly were poor producers. In the winter-spring division the lighter in body weight the birds were at sexual maturity the greater was the first year's egg production, but this was not true with the summer-fall birds. Early sexual maturity was associated with high egg production. There was no correlation between the number of eggs laid the first year and the size of eggs produced. The birds that laid the largest first dozen eggs tended to produce large eggs throughout the year, and the heavier pullets laid the heavier eggs. No association was found between age at sexual maturity and the average first year's body weight.

The record as the fundamental basis for the selection of breeding stock, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 16 (1927), No. 2, pp. 4, fig. 1*).—The author discusses the value of keeping a record of the growth and maturity of birds, consistency of egg production, individual characteristics, and chick production as a basis for selecting breeding stock.

Report of the New Jersey egg laying contests, November 1, 1926–October 23, 1927, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 16 (1927), No. 3, pp. 4*).—A report of the eleventh year of the Vineland egg-laying contest and the seventh year of the Bergen County egg-laying contest (*E. S. R.*, 56, p. 568).

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Missouri Station] (*Missouri Sta. Bul. 256 (1927), pp. 64–67*).—Results of several experiments, some of which are continuations of work previously noted (*E. S. R.*, 57, p. 464), are reported.

Studies in milk secretion: (a) Time relations in milk secretion; (b) mechanisms regulating variations in the composition of milk, A. C. Ragsdale, E. C. Elting, W. Gifford, and S. Brody.—A study of the dams of 3,625 cows and the sires of 4,090 daughters showed that immaturity and senescence of the parents at the time the calves were born had no effect on the butterfat production of the progeny at maturity.

Two cows on which milk records had been kept for several days were slaughtered and the udders were removed and milked out completely. In the case of 1 cow only 36.5 per cent of the normal amount of milk was secured and in the other 57.96 per cent. The first cow gave 15.9 per cent of the normal amount of butterfat and the second gave 46.44 per cent.

Massaging and regular milking of the udder of an unbred yearling heifer caused a gradual increase in the amount of secretion up until the time she was bred. After breeding the amount of secretion gradually dropped, but after calving she milked normally. The cessation of the normal oestrous cycle seemed to have an inhibiting effect on the amount of secretion in heifers in which milk secretion had been stimulated before the first pregnancy. Pregnancy stimulated udder growth and secretion after the fifth month.

The results of a study of 609 gestation periods showed that this period was approximately two days longer for Jersey cows than for Holstein cows, and that male calves were carried slightly longer than female calves.

A study of colostrum with special reference to the effect of heat (pasteurization) on its physicochemical, bacteriological, immunological, and nutritional changes, A. C. Ragsdale and C. W. Weber.—Pasteurization of colostrum at 140° F. for 30 minutes rendered it noninfectious for new-born calves, even though contaminated with *Mycobacterium tuberculosis*. It retained all the beneficial properties of raw colostrum as food for new-born calves.

The relative assimilation by dairy cows of clover and alfalfa hays and of rations of different calcium and phosphorus content, W. A. TURNER, T. S. HARDING, and A. M. HARTMAN (*Jour. Agr. Research* [U. S.], 35 (1927), No. 7, pp. 625-635, fig. 1).—In experiments by the U. S. D. A. Bureau of Dairy Industry cows were fed clover and alfalfa hay to determine the difference in the degree of assimilation of calcium and phosphorus in these feeds and also in diets in which the calcium-phosphorus ratio was varied. One cow was used through both phases of the work and another cow had to be substituted for in the second phase. During the first experiment the cows received a grain mixture of wheat bran, corn meal, linseed oil meal, and salt. The first three weeks they received clover hay and during the last three weeks alfalfa hay. In the second experiment the cows received a grain mixture low in phosphorus, consisting of corn meal, gluten feed, linseed oil meal, ground oats, and salt. Alfalfa hay was the roughage used. During the second half of this test, sodium phosphate was added to the ration in amounts sufficient to obtain a value of about 1.25 for the calcium-phosphorus ratio. Analyses were made of the feed and water ingested and of the feces and urine voided.

Both cows showed a negative calcium and phosphorus balance in the first experiment. However, there was a marked improvement in both calcium and phosphorus assimilation when alfalfa hay replaced the clover hay. The improved assimilation was accompanied by an increased milk yield. A study of the nitrogen balances showed that one cow suffered no digestive disturbances, while the other cow showed a somewhat disturbed condition.

When the phosphorus content of the ration was varied one cow showed, except for one week, a positive calcium balance which increased as the phosphorus of the ration increased. The phosphorus balance was negative during the low phosphorus period and positive during the high phosphorus period.

The other cow in this experiment showed a poor calcium balance and assimilation during the high phosphorus period, but the phosphorus balance and assimilation was better during the high phosphorus period. Metabolism experiments suggested a better assimilation of calcium and phosphorus when the value of the calcium-phosphorus ratio of the feed was 1.25 than when it was 2.5.

Feeding dairy cattle, E. WEAVER and B. ODERKIRK (*Iowa Sta. Circ. 107* (1927), pp. 56, figs. 8).—The authors present in a popular manner the principles underlying the feeding of dairy cattle. Among the topics discussed are the uses of feeds, the various feeds, characteristics of a good dairy ration, summer and winter feeding, feeding dry and fresh cows, calves, and bulls, and general considerations that are necessary for successful feeding.

The effect of inanition upon the yield and composition of cows' milk, O. R. OVERMAN and K. E. WRIGHT (*Jour. Agr. Research* [U. S.], 35 (1927), No. 7, pp. 637-644, figs. 4).—Three cows at the Illinois Experiment Station were given their usual feed and care and milked twice daily during a preliminary 10-day period. During this time three composite samples were taken of the milk of each cow. Following this preliminary period the cows were given water but no feed for 5 days in the case of 1 cow and for 6 days of the other 2. Samples of milk were taken during this period. All samples were analyzed for total solids, fat, total protein, lactose, and ash.

Inanition caused great reduction in the milk yield, the decrease being especially rapid during the first 3 days. As the milk yield decreased the percentage of all the components of milk except lactose increased. The fat percentage for the 3 cows was 2.5 to 4.65 times greater than the average during the preliminary period. The total solids increased with cow 1 from an average of 12.82 to 30.17 per cent and with cow 3 from 13.49 to 19.06 per cent. The maximum percentages of protein for the 3 cows were 2.14, 1.99, and 1.17 times and the maximum percentages of ash 1.7, 1.72, and 1.3 times the preliminary averages. Lactose decreased in all cases, being 33.9, 56.7, and 76.9 per cent, respectively, of the value for the preliminary average. Cow 3 had just begun her lactation period, while the other cows were approaching the end of their production. A comparison of the results led the authors to conclude that the changes due to inanition are not so marked when it occurs early in the lactation period.

The production of clean milk, F. HALE and J. L. LUSH (*Texas Sta. Circ. 48* (1927), pp. 25, pl. 1, figs. 14).—A popular discussion of the importance of clean milk, tests for clean milk, aids in producing such milk, cleaning utensils, cooling, objectional plant flavors, pasteurizing, and the influence of clean milk upon increased consumption, together with a list of helpful references.

The clarifier and the filter in processing milk, P. S. LUCAS, L. H. COOLEGE, O. T. GOODWIN, and R. J. WERDON (*Michigan Sta. Tech. Bul. 84* (1927), pp. 27).—Samples of milk ranging in volume from 2,000 to 5,000 lbs. were run through clarifiers and filters at varying temperatures to determine the merits of these machines. Forty-nine samples were run through a 5,000-lb. clarifier at temperatures ranging from 85 to 92° F., and 97 samples were clarified at temperatures of from 55 to 65°. Sixty-eight batches were run through 21- and 29-in. filters at temperatures of from 85 to 90°, and 74 batches were filtered at from 55 to 70°. Bacterial plate counts were made before and after each processing, and the groups of bacteria were differentiated by means of bromocresol purple and acetic acid solution. The effect of each process upon keeping quality was determined by the colorimetric hydrogen-ion method. The effect upon cream line as influenced by the two methods was measured by the Harding method (E. S. R., 46, p. 578). The efficiency of the two methods for

removing foreign material from the milk was compared by using a "vacuum" type sediment tester.

Of the samples clarified at from 85 to 92°, 71 per cent showed a bacterial increase of 28.1 per cent, 10 per cent showed no increase, and 19 per cent showed an average decrease of 11.7 per cent. When clarified at from 55 to 65°, 62 per cent of the samples showed an average increase of 25.9 per cent, 14 per cent showed no change, and 24 per cent had an average decrease of 12.2 per cent. Of the samples filtered at from 85 to 90°, 26 per cent showed an average increase in bacterial count of 24.4 per cent, 9 per cent showed no increase, and 65 per cent showed an average decrease of 19.3 per cent. When filtered at from 55 to 70°, 27 per cent of the samples showed an average increase of 24.7 per cent, 19 per cent showed no change, and 54 per cent showed an average decrease of 29.3 per cent. The clarifier showed some selective action in removing peptonizers, but the filter had no such effect. Filtration had no influence on keeping quality, but clarification reduced slightly this quality. Neither process affected the creaming ability to any great extent. Of the visible dirt, the clarifier removed 99 per cent at all temperatures and the filter was almost as efficient especially at the low temperatures. Filtering milk at temperatures of from 90 to 115° required a change of filter cloth every two hours. Washing the cloth reduced its efficiency.

[Experiments with dairy products at the Missouri Station], W. H. E. REID and E. R. GARRISON (*Missouri Sta. Bul.* 256 (1927), pp. 68, 69).—The results of two experiments are reported.

The effect of each ingredient in the manufacture of ice cream.—The effects of homogenization of ice cream are described in continuation of work previously noted (*E. S. R.*, 56, p. 570). Results were similar but not identical on a single or double stage homogenizer. High pressures on single stage gave the greatest viscosity, which was reduced slightly by introducing the second stage. This reduction improved the quality of the ice cream. Aging mixtures up to 72 hours, except those homogenized at extremely high pressures, resulted in greater viscosity and better quality in the finished product. Clumping of the fat particles occurred within 5 hours after homogenizing, while no clumping occurred in unprocessed mixes. Extremely high pressures tended to produce doughiness and toughness, while low pressures and no processing were conducive to poor body and texture, coldness, and coarseness in the product.

The deleterious effects of freezing on the physical and chemical properties of milk and cream.—Continuing this study (*E. S. R.*, 57, p. 466) batches of milk were exposed to varying temperatures below freezing for periods of 1 to 5 hours, then pasteurized at 142° F. for 30 minutes and again frozen at temperatures ranging from 0 to 30° for periods of 1 to 5 hours. Viscosity was decreased by pasteurizing and increased by freezing. Milk frozen and then pasteurized had a viscosity less than unpasteurized milk but greater than unfrozen pasteurized milk. Pasteurizing increased the surface tension, and freezing lowered the surface tension of unpasteurized milk. Freezing and then pasteurizing increased the surface tension over unfrozen pasteurized milk. As temperatures increased toward the freezing point the viscosity and the surface tension approached that of unfrozen milk. Specific gravity bore no direct relation to the time of freezing or the temperature at which milk was pasteurized. Freezing increased the clumping of fat globules, being greatest at the lowest temperatures. Pasteurization decreased the size of globules and dispersed the clumps.

Gelatinated buttermilk, A. D. BUEKE (*Oklahoma Sta. Bul.* 168 (1927), pp. 16).—A more detailed account of work previously noted (*E. S. R.*, 57, p. 373).

VETERINARY MEDICINE

Biennial report of the commissioner on domestic animals for the period ended June 30, 1926, J. M. WHITTLESEY (*Conn. Commr. Dom. Anim. Bten. Rpt.*, 10 (1925-26), pp. 35, pls 6).—This report deals with control and practice work, particularly with bovine tuberculosis, hog cholera, anthrax, bacillary white diarrhea, and infectious abortion.

Eleventh biennial report of the Kansas Live Stock Sanitary Commissioner, 1925-1926, J. H. MERCER (*Kans. Livestock Sanit. Commr. Bten. Rpt.*, 11 (1926-26), pp. 275, figs. 18).—This report, which includes the text of livestock laws and rules and regulations of Kansas, reports upon control and eradication work with bovine tuberculosis, hog cholera control and sanitary methods of handling hogs, and on other diseases and parasites of livestock.

Report of the veterinary director general for the year ending March 31, 1927, G. HILTON ET AL. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen.*, 1926-27, pp. 59, figs. 8).—This report from the Health of Animals Branch includes an account of the occurrence and control of contagious diseases, by A. E. Cameron (pp. 12-19), followed by statistical data (pp. 20-30), and a report of the pathological division, by E. A. Watson (pp. 31-36). In the first two appendixes E. A. Watson presents a report on the results of tuberculosis research (pp. 37-44). In the second appendix C. H. Weaver presents a report on poultry disease work conducted in cooperation with the experimental farms branch (pp. 45-53), and R. Barnes a report on meat and canned food inspection work (pp. 53-59).

Annual reports on veterinary work for the years 1923, 1924, and 1925 [trans. title], P. HANSEN and H. MØRKEBERG (*Aarsberet. Vet. Fysikat. [Denmark]*, 1923, pp. VII+184, pl. 1; 1924, pp. XIV+227, pl. 1; 1925, pp. XVII+173, pl. 1, figs. 2).—These are the usual annual reports in continuation of those previously noted (E. S. R., 50, p. 479).

[**Papers on comparative pathology**] (*Indian Sci. Cong. Proc. [Calcutta]*, 13 (1926), pp. 192, 289, 290, 291).—Papers relating to the diseases of domestic animals include the following: *Isospora* n. sp. and *Balantidium* n. sp. in Cattle, by H. Cooper and A. N. Gulati (p. 192); The Piroplasmoses of Cattle in India (pp. 289, 290) and The Coccidia of Cattle in India (p. 290), both by H. Cooper; Human Cases of *B. [acillus] suispestifer* Infection in Bombay, by P. N. Basu (p. 291); and The Pathogenicity of Bovine Coccidia, by H. Cooper (p. 291).

Some recent advances in the protection of cattle and other animals against disease, V-X (*Agr. Jour. India*, 21 (1926), Nos. 2, pp. 95-100, figs. 2; 4, pp. 313-317, pl. 1; 5, pp. 351-356; 6, pp. 419, 420; 22 (1927), Nos. 2, pp. 92-97 pl. 1; 4, pp. 281-286).—In continuation of the series previously noted (E. S. R., 55, p. 72), the following articles are presented: Part 5, Tick-borne Diseases, with Some Remarks on the Diseases of Cattle Caused by Protozoa (pp. 95-100) and part 6, The Piroplasmoses of Cattle in India (pp. 313-317), both by H. Cooper; part 7, Haemorrhagic Septicaemia in Cattle in India, by S. C. J. Bennett (pp. 351-356); part 8, Vaccination against Blackquarter in Cattle and Sheep (pp. 419, 420); part 9, Coccidiosis with Particular Reference to Bovine Coccidiosis and Its Significance as an Infection of Cattle in India, by H. Cooper (pp. 92-97); and part 10, Bursati, Summer Sores, or Cutaneous Habronemiasis: A Short Review of the Literature, by S. K. Sen (pp. 281-286).

Fourth report of the Government Institute for Veterinary Research ([Chosen] *Govt. Inst. Vet. Research Rpt.*, 4 (1927), Eng. abs., pp. 67).—The contributions presented include the following: Experimental Studies on Pro-

phylactic Inoculation against Rinderpest, Report III, by C. Kakizaki, S. Nakanishi, and T. Oizumi (pp. 1-46); Studies in Fowl Typhoid, by T. Konno (pp. 47-50); Statistical Observation of *Cysticercus inermis* in Native Korean Calves, by S. Nakanishi (pp. 51, 52); A Comparative Study of Virulency of Seed Lymph with Special Reference to the Relation between the Maximal Virulency and the Passages, by T. Matsumura (pp. 53, 54); Effects of Heat upon the Growth of Transplantable Tumors, by T. Fukushima and T. Fujii (p. 55); A Contribution to the Study of *Spirochaeta laverani* Breinl., by S. Akazawa (pp. 56, 57); The Prophylactic Action of Bayer 205 against Experimental Infection with a Trypanosome of the Formosan Water Buffalo, by K. Kasai and S. Akazawa (pp. 58, 59); Pathological Anatomy of the Experimental Trypanosomiasis of the Horse (pp. 60-64) and Pathological Anatomy of the Horse Fed upon Polished Rice in Combination of Vitamin B Deficiency (pp. 65, 66), both by T. Kimura, T. Fukushima, and T. Fujii; and Blood and Urinary Constituents of the Horse and the Calf as Analyzed by the Micro-method, by K. Naito, T. Shimamura, and K. Kuwabara (p. 67).

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci.*, 5 (1926), Nos. 2, pp. 49-118, figs. 5; 3, pp. 147-209, pls. 4; 4, pp. 221-321, figs. 6; 6 (1927), Nos. 1, pp. 1-100, pls. 3, figs. 4; 2, pp. 107-216, pls. 2).—The papers here presented are as follows:

On the Toxic Action of Carbon Disulfide, V [trans. title], by K. Muto (pp. 49-57, Eng. abs. pp. 56, 57) (*E. S. R.*, 55, p. 874); On the Precipitin Reaction in Bovine Contagious Pleuropneumonia [trans. title], by S. Ono (pp. 58-68, Eng. abs. pp. 66-68); Transplantation of the Horns in Cavicornia and Dehorning by a Simple Method [trans. title], by T. Kōmura (pp. 69-85, Jap. abs. pp. 84, 85); On *ElmERIA zürni* Found in Japan (pp. 86-93, Jap. abs. pp. 92, 93) and A Staining Method of Goat Coccidium and Coccidium Cyst (pp. 94-97, Jap. abs. pp. 96, 97), both by S. Nomi; Demonstration of Anthrax Bacillus in Imported Hides and Animal Hairs [trans. title], by H. Migita (pp. 98-104, Eng. abs. pp. 103, 104); On the Presence of the Virus in the Circulating Blood and Internal Organs of the Cattle Affected with Contagious Pleuropneumonia, by N. Nakamura, H. Futamura, and T. Watanuki (pp. 105-114, Jap. abs. pp. 113, 144); Statistics of Scheduled Animal Diseases in Japan for the Year 1925 (pp. 115, 116); The Fifth Annual Meeting of the Japanese Society of Veterinary Science (pp. 117, 118); Statistical Observations of *Cysticercus inermis* in Native Korean Calves, by S. Nakanishi (pp. 147-150, Jan. abs. pp. 149, 150); Histogenetical Studies of Abdominal Cancers in the Fowl [trans. title], by D. Niimi (pp. 151-182, Eng. abs. p. 182); On the Disinfection of Anthrax Spores with Chloride of Lime, by A. Iizuka (pp. 183-193, Jap. abs. p. 193); Contributions to Biological Studies on the Virus of Contagious Pleuropneumonia in Cattle, by N. Nakamura, H. Futamura, and T. Watanuki (pp. 194-209, Jap. abs. pp. 208, 209); Experimental Studies on Prophylactic Inoculation against Rinderpest, Report III, by C. Kakizaki, S. Nakanishi, and T. Oizumi (pp. 221-280, Jap. abs. pp. 276-280); An Experimental Study on the Virus of Fowl Pest.—I, On the Susceptibility of the Pigeon, by N. Nakamura and Y. Kawamura (pp. 281-295, Jap. abs. pp. 294, 295), (noted on page —); On the Practical Value of Several Serological Reactions for the Diagnosis of Contagious Pleuropneumonia in Cattle, by N. Nakamura, H. Futamura, and T. Watanuki (pp. 296-321, Jap. abs. p. 319); Studies on the Treatment of *Microfilaria immitis* Infection by Intravenous Injection of Sodium Antimonyl Tartrate [trans. title], by S. Itagaki and R. Makino (pp. 1-23, Eng. abs. pp. 15-23); On the Poisonous Action of Sweat-fungus Causing the Death of Man [trans. title], by K. Muto (pp. 24-31, Eng. abs. pp. 24-27); A Contribution to the Study of *Spirochaeta laverani* Breinl. [trans. title], by S.

Akazawa (pp. 32-51, Eng. abs. pp. 50, 51); On the Application of Papain for the Preparation of Culture Media, II [trans. title], by S. Suzuki (pp. 52-63, Eng. abs. p. 63); Observations on Contagious Pleuropneumonia of Cattle in South Manchuria [trans. title], by S. Yamagiwa (pp. 64-68, Ger. abs. p. 68); The Prophylactic Action of "Bayer 205" against Experimental Infection with a Trypanosome of the Formosan Water Buffalo [trans. title], by K. Kasai and S. Akazawa (pp. 69-100, Eng. abs. pp. 97-100); Experimental Studies on the Economical Rinderpest Vaccine, by C. Kakizaki, S. Nakanishi, and J. Nakamura (pp. 107-120, Jap. abs. p. 120); Transformation of the Sheep Pox Virus into the Vaccinia Virus by Means of Testicular Passage in Rabbits [trans. title], by N. Kii and H. Kasai (pp. 121-136, Eng. abs. pp. 135, 136); On the Ovinized Vaccine [trans. title], by N. Kii and H. Kasai (pp. 137-161, Eng. abs. pp. 159-161); On a Modification in the Shape and Staining of Flagella of Bacteria [trans. title], by K. Ogura (pp. 162-166, Jap. abs. pp. 165, 166); Studies on the Venereal Tumor in the Dog, Report 1, by S. Matsuba and I. Hiroye (pp. 167-174, Jap. abs. p. 174); On the "Wahi" or "Kose" Disease, an Elephantiasis-like Disease, in Cattle, I [trans. title], by H. Oguni (pp. 175-190, Eng. abs. pp. 188-190); Notes upon a Certain Anaerobe Isolated from Whale Muscle, II [trans. title], by Y. Kawamura, Y. Sannomiya, and T. Akechi (pp. 191-213, Eng. abs. pp. 209-213); and The Sixth Annual Meeting of the Japanese Society of Veterinary Science (pp. 215, 216).

Report of chief veterinary research officer, J. WALKER (*Kenya Colony Dept. Agr. Ann. Rpt. 1926*, pp. 62-117, figs. 2).—The research work reported upon relates particularly to rinderpest, East Coast fever, bovine lymphangitis, mortality in calves, paratyphoid infection in calves, observations on a lung affection of lambs and sheep, parasitic worms, and East African hog cholera.

[Papers on livestock diseases and parasites] (*So. African Jour. Sci.*, 23 (1926), pp. 526-548, 551-555, 589-594, 603-619, 713-715, 723-725, 755-763, pls. 6, figs. 4).—The papers presented relating to livestock diseases and parasites include the following: Equine Paratuberculosis, by A. Theiler and E. M. Robinson (pp. 526-531); The Occurrence of Paratyphoid, *Bacillus enteritidis*, Infection in Calves in South Africa, by P. R. Viljoen and G. Martinaglia (pp. 532-544); The Longevity of *Bacillus abortus* Bang in Emulsion, by C. P. Neser (pp. 545-548); A Preliminary Communication Regarding Anthrax Spore Vaccine and Its Use in South Africa, by P. R. Viljoen and H. H. Curson (pp. 551-555); Two Cases of Rhinosporidiosis in Equines, by J. Quinlan and G. de Kock (pp. 589-594); Antimosan (Heyden 661), Bayer 205, and Tartarus Stibiatus in Experimental *Trypanosoma congolense* and *T. brucei* infections in Mice, by H. H. Curson (pp. 603-608); The Transmission of Tick-borne Diseases by the Intra-jugular Injection of the Emulsified Intermediary Host Itself, by A. Theiler and P. J. du Toit (pp. 609-619); The Oviposition of Some Strongylidae: Laboratory Observations and Practical Deductions, by F. Veglia (pp. 713-715); Observations on the Nature of the Immunity Conferred to East Coast Fever by Natural Infection, or Exposure thereto, in Inoculated and Noninoculated Cattle, by J. Walker (pp. 723-725); The Differences between Anaplasma and Jolly Bodies, by G. de Kock and J. Quinlan (pp. 755-759); and A Case of Demodectic Mange in the Goat, by P. J. J. Fourie (pp. 760-763).

Vade-mecum of parasitology, J. LOISELET (*Vade-Mecum de Parasitologie. Paris: E. Le François, 1927*, pp. 153).—The parts of this guide deal, respectively, with treponemes and spirochetosis (pp. 9-20), Protozoa (pp. 21-40), Helminthes (pp. 41-82), Arthropoda (pp. 83-103), and mycoses (pp. 105-117). A mycological glossary is included (pp. 119-147).

Experimental investigations of the verminous toxins: Anaphylaxis, P. A. JULIEN (*Recherches Expérimentales sur les Toxines Vermineuses Anaplasie. Paris: Le François, 1926, pp. 65*).—This work, following a brief introduction and a historical discussion, reports experimental work with ascarid toxins, particularly the perienteric liquid of *Ascaris megalocephala*, and takes up anaphylaxis. It was found that the perienteric liquid of *A. megalocephala* is toxic not only to laboratory animals but also to the horse. Horses infested by ascarids are immunized little by little against the action of the toxin secreted by these parasites. In such animals the instillation of the perienteric liquid does not produce any general ocular reaction. The serum of horses infested with ascarids contains specific antibodies capable of neutralizing in vitro very weak dilutions of the ascarid toxin. Among the other parasites of the intestines of the horse, the sclerostome alone secretes a substance capable of producing the ocular reaction, the reaction being less frequently met with and weaker than that produced by the ascarid liquid. A bibliography of 44 titles is included.

Studies on the rate of development and viability of the eggs of *Ascaris lumbricoides* and *Trichuris trichiura* under field conditions, H. W. BROWN (*Jour. Parasitol., 14 (1927), No. 1, pp. 1-15, figs. 3*).—Cultures of human feces containing *Ascaris* eggs deposited upon sand, loam, clay, and humus soils in the sun and the shade at Penonomé, Panama, contained eggs with motile embryos within 15 days. Cultures on sand in the sun did not produce any embryonated eggs, and in 21 days all the ova had degenerated. In the sandy soil culture in the shade 35 days after planting 90.8 per cent of the eggs contained motile embryos; 19 days later 69 per cent of the eggs were in this stage, the rest being degenerate. In clay soil cultures after 21 days, 85 per cent of the eggs in the shaded culture and 71 per cent of the eggs in the sun culture were in the motile embryo stage. In loam soil cultures at 21 days, 89.3 per cent of the eggs in the shaded culture and 54 per cent of the eggs in the sun culture were in the motile embryo stage. Development of *Ascaris* eggs in humus soil cultures was at least 20 days behind that in sand, clay, and loam soils. In sand soil cultures in the shade 33 per cent of the *Trichuris* eggs developed to motile embryo stage by the twenty-first day of the culture and 74 per cent by the thirty-fifth day. No *Trichuris* eggs developed as far as the motile embryo stage in the sand culture in the direct sunlight. Results indicate that the type of soil is an important factor in the rate of development and viability of *Ascaris* and *Trichuris* eggs.

Observations on the development of *Ascaris* ova, C. MANALANG (*Philippine Jour. Sci., 33 (1927), No. 3, pp. 249-255*).—Reports of observations of *A. lumbricoides*.

Demodectic or follicular mange in cattle, M. IMES (*Jour. Amer. Leather Chem. Assoc., 22 (1927), No. 10, pp. 531-533*).—This is a paper presented at the annual meeting of the American Leather Chemists Association at Cincinnati, Ohio, in June, 1927.

The effects of ultraviolet and infra-red irradiation on *Demodex folliculorum*, C. SHEARD and J. G. HARDENBERGH (*Jour. Parasitol., 14 (1927), No. 1, pp. 36-42, pl. 1*).—In experiments conducted by the authors it was found that at temperatures of about 40° C. (104° F.) the movement of *D. folliculorum* became fairly marked under the microscope (×100) and at 45° very marked and active. This furnished a simple criterion by which to select the living from the dead parasites.

A temperature of 54° ± 1°, obtained either by ordinary heating methods or from infra-red irradiation and applied for from 5 to 10 minutes, was lethal

to Demodex. Weak solutions of mercurochrome had no apparent effect in hastening the death of the parasites or of causing them to die at a temperature lower than $54^{\circ} \pm 1^{\circ}$. Immediately after irradiation with the ultra-violet lamp for from 2 to 20 minutes there was increased activity of the Demodex kept under the initial control temperature of 25° . Irradiation for from 15 to 30 minutes by the energy from a quartz mercury arc lamp operated at 90 volts and at a distance of 50 cm. produced lethal effects in some instances at the end of 24 hours at the control temperature of 25° , and general destruction of all directly irradiated parasites followed within 48 hours after such initial periods of irradiation. Irradiation of the parasites with ultra-violet light, followed by dry heat or infra-red irradiation, caused lethal effects at temperatures considerably below those at which death takes place normally. Simultaneous irradiation with ultra-violet light (from a quartz mercury vapor lamp) and infra-red (heat) energy produced lethal effects more rapidly than did the consecutive application of these two types of irradiation. The daily irradiation of an animal having demodectic mange for 15 to 45 minutes with an air-cooled quartz mercury arc lamp, operated at 90 volts and at a distance of 50 cm., apparently seems to maintain the general physical tone of the whole animal at a higher level, and thereby aids in combating the untoward conditions set up in the host by the invading parasites.

Paradichlorobenzene as an anthelmintic. G. DIKMANS (*Jour. Agr. Research* [U. S.], 35 (1927), No. 7, pp. 645-649).—This is a report of experiments conducted at the Porto Rico Experiment Station, the details of which are given in tabular form. It was found that when administered to dogs in doses of 0.1, 0.3, 0.5, and 1 gm. per kilogram of body weight in bland oils and in crystal form, followed by a bland oil in some instances and by a purgative oil in others, paradichlorobenzene was somewhat efficacious against intestinal worms. The results obtained, however, were not sufficiently uniform to permit classifying it as an efficient anthelmintic.

The systolic blood pressure of the normal rabbit measured by a slightly modified Van Leersum method. R. DOMINGUEZ (*Jour. Expt. Med.*, 46 (1927), No. 3, pp. 443-461).—The blood pressure and pulse rate of 90 normal rabbits was studied for various periods of time, from 1 day (accidental death interrupting the observation) to 15 months. The main data are presented in a table containing the blood pressure and pulse rate on the first day of observation and the maximum and minimum of both during the entire period of observation of each animal, together with the sex and weight of the animal. Separate tables are given showing the distribution of blood pressure, pulse rate, and the maximum blood pressure by animals. Detailed data on two animals observed for the longest time are given in tabular form. The anatomical changes that occur in some carotids inclosed in a loop are described and discussed. It was found that the blood pressure of the normal rabbit ranges between 70 and 170 mm. of mercury. The pulse rate, taken simultaneously with the blood pressure, fluctuated between 112 and 300 per minute.

A bloodless method for taking repeated blood pressure readings in laboratory animals. L. MCGREGOR (*Amer. Jour. Path.*, 3 (1927), No. 5, pp. 576, 577).—The author describes a method in which the phonendoscope is applied over the termination of the abdominal aorta. Normal aortic systolic pressure in rabbits was found to vary from 115 to 140 mm. of mercury.

On the titration of bacteriophage and the particulate hypothesis. H. CLARK (*Jour. Gen. Physiol.*, 11 (1927), No. 1, pp. 71-81).—The theory of the serial dilution method of titration of bacteriophage has been worked out by the author on the basis of the simple particulate hypothesis. It is shown that the dilution constant is 0.1. Only about 60 per cent of parallel runs on the

same solution should give the same end point, the average being taken over a great number of titrations of each of a great variety of solutions.

A pleomorphic and gas-forming bipolar bacillus isolated from the lymph glands of slaughtered cattle, O. GARCIA (*Philippine Jour. Sci.*, 33 (1927), No. 4, pp. 331-347, pls. 2).—The author describes three strains of a bacillus isolated from the lymph glands of cattle slaughtered at Manila. All three of the strains were found to be pathogenic for rabbits, guinea pigs, mice, and chickens. Death occurs in from 5 to 48 hours following inoculation, although rabbits die in a much shorter period, as they are more susceptible than are guinea pigs. In chickens the organism in question produced symptoms similar to those known in chickens infected with *Bacterium pullorum*. The only previous history of the cattle from which the lymph glands were taken was that one of the animals came from Mindoro Province. Whether or not this organism is the same as that described by the Government bacteriologist at Hong-kong, as cited by Woolley and Jobling (*E. S. R.*, 16, p. 101), the author is unable to say. The morphology, some biological characteristics, and the pathogenicity of the organisms isolated led him to the conclusion that they belong to the hemorrhagic septicemia group.

Anthrax: Its nature and control, P. R. VILJOEN (*Union So. Africa Dept. Agr. Bul.* 31 (1927), pp. 12, figs. 4).—This is a practical account.

The action of salvarsan compounds, including stovarsol and treparsol, in experimental anthrax [trans. title], N. STOLYGO (*Centbl. Bakt. [etc]*, 1. Abt., Orig., 102 (1927), No. 6-7, pp. 364-367; *abn. in Trop. Vet. Bul.*, 15 (1927), No. 3, pp. 110, 111).—Treparsol and stovarsol were found to be ineffective even in large subtoxic doses. More encouraging results were obtained from the use of salvarsan.

Studies on pathogenic *B. coli* from bovine sources, I-IV (*Jour. Expt. Med.*, 46 (1927), No. 1, pp. 123-131, fig. 1; pp. 133-140, pls. 2; pp. 141-154; pp. 155-166).—The four successive parts of the subject dealt with are as follows: The Pathogenic Action of Culture Filtrates, by T. Smith and R. B. Little; Mutations and Their Immunological Significance, by T. Smith and G. Bryant; Normal and Serologically Induced Resistance to *B. [acillus] coli* and Its Mutant, by T. Smith; and A Biochemical Study of the Capsular Substance, by D. E. Smith.

The relatively young bouillon filtrates, 24 and 48 hours old, of certain strains of *B. coli* obtained directly from the ileum of scouring calves were highly toxic for calves about 1 month old, as well as for older calves and cows when intravenously injected. The symptoms of panting followed by dyspnea and jerky respiration, indicate some at first obstructive action upon the alveolar and endothelial cells, followed by a greater permeability and eventual filling up of the air spaces with a serous, fibrinous, and hemorrhagic exudate. Similar effects are produced in other organs, such as the liver and kidneys, if the toxin reaches them or is formed there by multiplying bacteria. There are no immediate or remote effects resembling those on calves following the intraperitoneal or the intracardiac injection of *B. coli* filtrates into guinea pigs even when the dose represents many multiples per body weight of the dangerous or even fatal calf dose.

On the mutual immunization in aphthae epizooticae and vaccine, C. F. VAN OIJEN (*K. Akad. Wetensch. Amsterdam, Proc.*, 30 (1927), No. 5, pp. 543-551, figs. 8).—The studies here reported are considered significant for the reason that a close relationship between the foot-and-mouth disease and the vaccine virus was proved for the first time by scientific experiments. The immunity from the vaccine virus, after inoculation with the aphtha virus, points to a relationship between the two viruses. It is considered to matter little

that in these experiments vaccine inoculation did not produce immunity against foot-and-mouth disease virus, since it could also be established that inoculation with different aphtha strains did not yield immunity against other virulent foot-and-mouth disease virus. It is pointed out that on the basis of such relationship it may very well be possible that an intracutaneous vaccine injection properly carried out would yield a sufficient immunity against contact infections with aphtha virus to make it serviceable for practice.

An outbreak of gastro-enteritis: Milk-borne epidemic at Dyersburg, Tenn., caused by *Salmonella suipestifer*, H. C. STEWART and W. LITTERER (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 19, pp. 1584-1587).—This is a report of an outbreak of gastro-enteritis, involving more than 150 people, which occurred at Dyersburg, Tenn., in the first week of September. Symptoms of a toxic nature were noted, such as severe headache, nausea and vomiting, diarrhea, and profound muscular weakness. A few cases showed delirium. The incubation period ranged from 8 to 36 hours, and recovery was practically complete within a week. The raw milk supply was the source of the infection. The organism isolated was found to conform in its morphology, tinctorial and serologic reactions, and virulence to rabbits to *S. suipestifer* (*Bacillus cholerae-suis*). It is considered probable that the infection gained entrance to the milk through lax measures in cleaning the udders and flanks of the cows. In a review of the literature the authors failed to find any report of an outbreak caused by milk contamination with this organism.

Malta fever, with special reference to the Phoenix, Ariz., epidemic of 1922, W. W. WATKINS and G. C. LAKE (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 19, pp. 1581-1584).—This is an account of an epidemic of Malta fever which occurred in Phoenix, Ariz., and proved to be due to raw goat's milk, as noted from another source. (*E. S. R.*, 48, p. 482).

Treatment of saccharomycosis at Semarang, Java, by means of naganol [Bayer 205] [trans. title], W. TREFFERS (*Nederland, Indische Bl. Diergeneesk.*, 39 (1927), pp. 288-307; *Eng. abs.*, p. 307).—The author reports an increase in saccharomycosis of horses at Semarang during the years 1920-1925 in spite of sanitary police measures. Control since 1925 has consisted in the isolation of all affected animals in one stable and operative and antiseptic treatment. The use of a 50 per cent solution of caustic soda has given good results. Forty-five horses were treated, partly with naganol, partly with naganol and atoxyl (3 gm. of each in a 5 per cent solution injected into jugular vein), and partly without injections. The same local caustic-antiseptic and operative treatment applied to them all resulted in the rise of the curing percentage and shortening of the duration of treatment from 56 to 34 days (on an average) through quicker maturation of the abscesses and the absorption of incipient processes. The influence of the combination of naganol and atoxyl was stronger than that of naganol alone.

Investigations on the Bang abortion disease in cattle and swine, J. W. CONNAWAY ET AL. (*Missouri Sta. Bul.* 256 (1927), pp. 97-99).—The work here reported upon is dealt with under three headings.

A study of the transmissibility of abortion infection in cattle and swine from immune dams to progeny, J. W. Connaway, H. G. Newman, and A. W. Uren (pp. 97, 98).—Studies were continued during the year (*E. S. R.*, 57, p. 467) upon an experimental herd of 16 mature beef-bred grade cows containing 5 persistent abortion reactors which have from time to time discharged abortion bacteria through the milk. The progeny of these infected cows have not in any instance given evidence of permanent infection with the organism, even though each calf of an infected dam remained with its mother continuously

during the full lactation period and imbibed the infected milk at will until weaned naturally. The positive antibody reaction of the blood of the nursing has disappeared in every case before the advent of sexual maturity; and in no instance has one of the calves of the infected cows of this group, nor one of the progeny of the second and third generation, acquired permanent infection after reaching sexual maturity, although exposed at pasture to the infected and positive reacting dams and granddams except for a period at the time of calving of the infected cows. The work is considered to give ample and convincing proof that the progeny of the relatively immune abortion-infected cows can, by proper management, be reared under practical farm conditions to maturity without acquiring a permanent infection from the infected dams. It is stated that the milk-borne infection in the positive reactors of the herd is still pathogenic for guinea pigs and has recently been isolated again in pure culture.

Experiments to determine the efficacy of intravenous injections of drugs to destroy the Bacillus abortus (Bang) in cattle, J. W. Connaway, A. W. Uren, and H. G. Newman (pp. 98, 99).—This is a brief report of experiments in three different herds. Preliminary tests with mercurochrome produced local swellings in the necks of two out of four animals upon which it was used, resulting in the substitution of acriflavine, an aqueous solution of which was injected intravenously into 30 abortion-infected cattle. Each animal received three injections of 200 cc. each of a 1-200 solution of the drug at 7-day intervals. No harmful systemic effects were observed, no pregnant cow aborted, and three have calved normally since the injection. In monthly agglutination tests 4 of the treated animals which reacted before treatment became negative reactors in 4 to 6 months. It is considered too early to draw conclusions, since the other cows under observation still react positively.

Comparative studies on the serological tests for the Bang abortion antibodies in cattle, J. W. Connaway, H. G. Newman, and A. W. Uren (p. 99).—In agglutination tests conducted in cooperation with the Pennsylvania Bureau of Animal Industry and 10 other State or official laboratories, all used six dilutions of serum ranging from 1 to 25 to 1 to 1,000. The findings of 10 of the 12 laboratories were in full agreement, within the practical diagnostic range of serum dilutions, as to diagnosis of all the blood samples, while 2 laboratories, though in the main in accord with the other 10, showed aberrant results that would confuse the diagnosis. Further confirmation of the agglutination test was made by application of the complement fixation and the rapid agglutination tests, both of which gave the same diagnostic results. Variations in the density of antigens from 0.7 to 2, compared with the McFarland nephelometer, did not affect the diagnostic results.

Studies on abortion in cattle, C. C. PALMER (*Delaware Sta. Bul. 152 (1927), p. 11*).—In work with this disease, animals giving positive reactions to the agglutination test were isolated at calving time or removed from the herd as in previous years. The university dairy herd, 20 per cent of which had given positive reactions 5 years previously, continued to remain free from the disease (E. S. R., 56, p. 377). It is pointed out that at the time the work was commenced the infection was on the increase, and that the results were obtained through removal from the herd of positive reactors at calving time only. Similar results are being obtained in other herds in which the work is conducted.

Studies of semen for potency of breeding bulls, A. W. UREN (*Missouri Sta. Bul. 256 (1927), p. 100*).—In the study of a number of sires during the year, impotency was found to be due to scarcity and diminished motility of the spermatozoa, as well as to morphological changes of an evidently path-

ological nature. Reference is made to a so-called breeder's bag designed by the author and used to secure the uncontaminated semen and determine the quantity. Its use permits maintenance through placing in a water bath at a temperature held most favorable to resistance and conservation of the vitality of the spermatozoa.

Bradsot, A. M. HIBMA (*Tijdschr. Diergeneesk.*, 54 (1927), No. 21, pp. 998-1003; *Ger., Eng., Fr. abs.*, p. 1003).—In this preliminary account the author describes a disease occurring among sheep on the island of Terschelling, Netherlands, which greatly resembles bradsot. Inflammation of the duodenum was observed, but lesions of the abomasum were wanting.

Poultry disease investigations, A. J. DURANT (*Missouri Sta. Bul.* 256 (1927), pp. 100-102, figs. 2).—In continuation of work of the previous year (E. S. R., 57, p. 467) the operation of cecal ablation for the prevention of enterohepatitis in turkeys was performed on 25 birds and an equal number left untreated as controls. Both groups were placed on badly infected grounds, resulting in 21 of the control birds contracting blackhead disease while none of the ablated birds showed any evidence of the disease clinically or upon post-mortem. The duration of continuous exposure for ablated birds varied from 3 up to 14 months. It was observed that even when only one cecum had been tied off such birds were apparently more resistant than others that had not been operated upon.

In a further study of inherited incoordination of muscles in newly hatched chicks, it was found that male birds of the tainted family mated to healthy pullets of unrelated families produced from 14 to 15 per cent of chicks showing the clinical manifestations of incoordination of muscles. The studies indicate that females of the tainted family do not transmit the disease character to the immediate offspring in a clinically demonstrable form.

An experimental study on the virus of fowl-pest.—I, On the susceptibility of the pigeon, N. NAKAMURA and Y. KAWAMURA (*Jour. Japan. Soc. Vet. Sci.*, 5 (1926), No. 4, pp. 281-295; *Jap. abs.*, pp. 294, 295).—This is a report of experiments on the susceptibility of the pigeon to the virus of fowl pest and some observations of the infected animals. The transmission of the disease to pigeons was successful by feeding a large amount of the virus, instillation into the conjunctival sac, application to the scarified skin, or by cloacal injection, but not by the cohabitation of pigeons with affected fowls or pigeons. The successive passage of the virus through the pigeon is possible, and the virus passed through pigeons is able to produce the disease in chickens. A study made of the red and white cells included typing of the leucocytes, the details of which are given in tabular form. It was found that within 3 or 4 days before the occurrence of symptoms the pseudoeosinophilic leucocytes increased to more than 2 or 3 times the normal number, and that the number of lymphocytes decreased. In the case of a pigeon infected with the virus of fowl pest, the lymphocytes increased and the pseudoeosinophilic cells decreased.

Studies on fowl typhoid, H. R. BAKER (*Delaware Sta. Bul.* 152 (1927), p. 11).—In studies made during the year of the pathogenic and antigenic properties of *Bacterium sanguinarum* it was found that strains possessing the highest virulence rarely killed more than 33 per cent of the birds inoculated. The virulence was soon lost in strains growing upon artificial media, and after two or three transfers at 7-day intervals upon artificial media, virulent strains became avirulent. In the antigenic studies, healthy fowls received three vaccinations, at intervals of 10 days, of 2 cc. of a living avirulent 24-hour broth culture of the fowl typhoid organism. Ten days after the last vaccination, all of the vaccinated and check birds received 2 cc. of a 24-hour broth culture of a virulent strain of the organism. The first trial resulted in a mortality of 35

per cent of the checks and 10 per cent of the vaccinated birds, and the second trial in 15 per cent of the checks and 5 per cent of the vaccinated birds.

Effect of repeated bleeding upon resistance of chickens to parasitism. J. E. ACKERT (*Jour. Parasitol.*, 12 (1926), No. 3, p. 163).—The author finds that repeated bleeding makes young chickens more susceptible to *Ascaridia perspicillum*, indicating that the blood may be the seat of resistance to this intestinal parasite of chickens (E. S. R., 56 p. 875).

Vitamin B a factor in the resistance of chickens to *Ascaridia perspicillum* (Rud.), N. B. ZIMMERMAN, L. B. VINCENT, and J. E. ACKERT (*Jour. Parasitol.*, 12 (1926), No. 3, p. 164).—Young chicks fed on a diet deficient in vitamin B, but adequate in all the other food substances, appeared to be less resistant to parasitism by *A. perspicillum* (E. S. R., 56, p. 875). The worms in the intestines of the chickens of this group were much more numerous and grew to be significantly larger than those in chicks of the same age, raised under the same conditions, but given a ration which was entirely adequate.

The effect of the nematode *Ascaridia perspicillum* on the blood-sugar content of chickens. J. E. ACKERT and R. W. TITUS (*Anat. Rec.*, 29 (1924), No. 2, p. 120).—The results of tests on 25 control and 28 parasitized birds showed that the blood sugar content of those parasitized was distinctly less than that of the controls, the difference between the two means being more than six times its probable error, which shows that the chances are over 20,000 to 1 that the difference is significant (E. S. R., 56, p. 875).

On Manson's eye worm in poultry. A. L. SHEALY (*Science*, 66 (1927), No. 1714, pp. 426, 427).—This account deals with reports previously noted (E. S. R., 56, p. 879; 57, p. 381), of Fielding from Australia and Sanders from Florida, who found that the cockroach *Pycnoscelus (Leucophaea) surinamensis* L. is an intermediary host of this nematode. The possibility of infecting many different kinds of wild birds by feeding them infected cockroaches is announced.

Kamala, a satisfactory anthelmintic for tapeworms in poultry. M. C. HALL and J. SHILLINGER (*Jour. Parasitol.*, 12 (1926), No. 3, p. 166).—Reference is made to the work with this anthelmintic, accounts of which have been noted (E. S. R., 55, pp. 178, 271).

Subulura brumpti from the turkey in Porto Rico. E. B. CRAM (*Jour. Parasitol.*, 12 (1926), No. 3, p. 164).—The author records the collection of this parasite from the ceca of a turkey in Porto Rico, this constituting a new host and a new locality.

Cod-liver oil for "snuffles" in rabbits and pneumonia in guinea-pigs. H. L. IBSEN (*Science*, 66 (1927), No. 1717, pp. 509, 510).—The author has found that the feeding of 2 per cent of cod-liver oil with the grain ration prevents the disease of rabbits known as snuffles, indicating that the ultra-violet rays in the sunlight have been responsible for the prevention of this disease of rabbits kept in outdoor hutches.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Missouri Station], J. C. WOOLEY ET AL. (*Missouri Sta. Bul.* 256 (1927), pp. 40-44, fig. 1).—These studies continue in part those previously noted (E. S. R., 54, p. 778). Data from investigations on the use of electricity in agriculture, the clearing of cut-over lands, farm sewage disposal, farm structures, the use of a small sweet clover huller and scarifier, the draft of farm implements, and the preservation of wood fence posts are briefly summarized.

In feed grinding with electricity it was found that the total operating expense, including interest and depreciation, was 8.7 cts. per bushel.

Experiments with a rotary plow attachment for a tractor in which a machine was used to prepare a seed bed at one operation showed that a much greater number of weeds occurred in the rotary plowed plat. These were large weeds not located in the hills but quite generally distributed. Much difficulty was encountered in cultivating corn in a rotary plowed plat due to the mass of weeds so close to the surface.

In studies of wood fence post preservation, the varieties which seem to take treatment to the best advantage are black walnut, white oak, red oak, black oak, sassafras, red bud, Kentucky coffee bean, honey locust, and black ash. The double tank treatment with creosote has been effective enough to make it worth while with these varieties, as apparently this treatment approximately doubles their serviceable life. Such woods as willow, maple, and cottonwood do not justify the treatment.

An analysis of the cost of tile drainage installation on the farm, H. B. ROE (*Minnesota Sta. Tech. Bul.* 47 (1927), pp. 82, figs. 24).—A mass of data on the cost of tile drainage installation on Minnesota farms is analyzed and presented in a form for ready use by agricultural engineers. It reports the results of investigations carried on from 1908 to 1921, inclusive, and considers rolling, flat, and peat land.

Public Roads, [November, 1927] (*U. S. Dept. Agr., Public Roads*, 8 (1927), No. 9, pp. 191-214+[2], figs. 23).—This number of this periodical contains the status of Federal-aid highway construction as of October 31, 1927, together with the following articles: Surface Treatment of Topsoil Roads, by J. T. Pauls (pp. 191-202); The Action of Sulphate Water on Concrete, by D. G. Miller (pp. 203-213) (see below); Regional Highway Planning Survey for Cleveland (p. 213); and Gasoline Taxes for First Six Months of 1927 (p. 214).

Cement requirements for some concrete mixes, H. ALLEN (*Concrete [Chicago], Cement Mill Ed.*, 31 (1927), No. 5, pp. 13-17, figs. 2).—The cement requirements for certain concrete mixes are tabulated, as developed at the Kansas State Testing Laboratory.

Flow of water through porous concrete, W. G. KIRCHOFFER (*Water Works*, 66 (1927), No. 9, pp. 351-354, figs. 9).—Experiments on the loss in head when water is passed through porous concrete are reported, from which conclusions are drawn as to the type of concrete slab which will make a good substitute for well screens and for pipe manifolds and strains in filter bottoms.

The results indicate that for well screens clogging is apparently overcome, for filter bottoms washing may be done satisfactorily without injury to the filters, and that in general porous concrete is well adapted for such uses.

Tested methods for waterproofing concrete, F. E. FOGLE (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 63-67, figs. 2).—Data are reported on methods of waterproofing concrete, particularly for use in floors, foundations, and walls.

Design and construction of formwork for concrete structures, A. E. WYNN (*London: Concrete Pubs.*, [1926], pp. XII+296, figs. 219).—This book contains chapters on form building in general; materials, loads, pressures, and stresses; theoretical design of forms; design tables; design problems; detail construction of footing forms; detail construction of column forms; wall forms; detail construction of beam and girder floor forms; forms for rib floors and structural steel fireproofing; miscellaneous forms in building construction; forms for flat slab construction; forms for conduits, sewers, and culverts; forms for tanks, silos, bins, and standpipes; forms for dams, piers, and heavy walls; steel forms in building and wall construction; steel forms for curved surfaces; arch falsework; other bridge forms; patent devices; and planning the work.

The action of sulphate water on concrete, D. G. MILLER (*U. S. Dept. Agr., Public Roads*, 8 (1927), No. 9, pp. 203-213, figs. 8).—The results of further tests

of specimens of concrete immersed in Medicine Lake, S. Dak., made by the Minnesota Experiment Station in cooperation with U. S. D. A. Bureau of Public Roads and the Department of Drainage and Waters of the State of Minnesota are presented and summarized (E. S. R., 56, p. 178). These tests have been conducted on concrete cylinders for periods up to 3.5 years.

The results indicate that standard Portland cements from different manufacturing plants vary greatly in resistance. All cylinders of high alumina cements made satisfactory showings up to and including 3 years' exposure, with a few exceptions. The inference is, however, that high alumina cements, while more resistant than standard Portland cements, are not of such high resistance as will permit the use of extremely lean mixtures for concrete subject to the action of sulfate waters. Specimens cured in steam at a temperature of 212° F. continued to make excellent showings in all cases, and without exception, averaged stronger after 3 years' immersion than they did at 1 year. Such cylinders made equally favorable showings, irrespective of the brand of cement used in the mix. There was slight difference between the specimens cured in steam at 212° and those cured at higher temperatures up to 285°.

The results appeared to indicate that certain admixtures, if properly handled, may have sufficient value in developing resistance to justify their use under special conditions.

Report on heat flow through a roof by research laboratory, F. C. HOUGHTEN (*Jour. Amer. Soc. Heating and Ventilating Engin.*, 33 (1927), No. 5, pp. 309-325, figs. 12).—Studies are reported which showed that heat flow meters can be successfully used to determine the flow of heat into a building during summer, and give constants which check values on the same roof under more favorable conditions even under such variations as when the direction of the flow may change every few hours. It was further found that heat flow into a building through an uninsulated roof in hot weather may be very great, and is an important factor in making the upper floors of such a building uncomfortably hot. The color and character of a roof surface are important factors in controlling heat absorbed through the roof of a building. It is considered possible under certain conditions to change the direction of flow from inward to outward.

Studies of combustion in the gasoline engine, I, II, W. G. LOVELL, J. D. COLEMAN, and T. A. BOYD (*Indus. and Engin. Chem.*, 19 (1927), No. 3, pp. 373-378, figs. 10).—The first two contributions to the subject are presented.

I. Determination of rate of burning by chemical analysis (pp. 373-376).—As a departure from the usual methods of investigating combustion in gasoline engines, a study was made of the burning during its progress from a chemical point of view. The ordinary method of examining combustion by means of the engine exhaust is subject to the disadvantages that combustion occurs so long before the exhaust stroke that the final products do not give definite information as to how it has proceeded. It is considered important, therefore, to sample gases from the cylinder during the actual explosion period. For this purpose a special quick acting, water cooled sampling valve was devised, which makes it possible to follow the progress of combustion. This new experimental method was found to yield data particularly adapted for determining the rate of combustion. The knock is accompanied by an increase in the rate of burning of the gasoline, whether the detonation is caused by the addition of kerosene or by the presence of a chemical knock inducer. In the presence of tetraethyl lead gasoline was found to burn at about its normal rate.

II. The burning of hydrogen and carbon monoxide (pp. 376-378).—The results of the experiments indicated that simultaneous burning of carbon

monoxide and hydrogen in a gasoline engine probably takes place according to the reactions $2\text{H}_2 + \text{O}_2 \rightarrow$ where the ratio of the velocity constants $k_{\text{H}_2}:k_{\text{CO}}=2.3$. Neither these reactions nor their relative rates are changed by a small increase in the compression ratio or by the presence of a knock inducer or a knock suppressor as long as detonation does not occur. The simultaneous combustion of two individual fuels in an engine at rates widely different for each does not appear to be in agreement with the concept of a narrow zone of flame advancing across the cylinder within which combustion is completed.

Combustion time in the engine cylinder and its effect on engine performance, C. F. MARVIN, JR. (*Natl. Advisory Com. Aeronaut. [U. S.] Rpt. 276 (1927), pp. [2]+16+[1], figs. 17*).—As a part of a general program to study combustion in the engine cylinder and to correlate the phenomena of combustion with the observed performance of actual engines, an outline is presented of what may happen in the engine cylinder during the burning of a charge.

A theoretical concept of a flame front which is assumed to advance radially from the point of ignition is presented, and calculations based on the area and velocity of this flame and the density of the unburned gases are made to determine the mass rate of combustion. From this rate the mass which has been burned and the pressure at any instant during combustion are computed. This process is then reversed in an effort to determine actual rates of combustion and flame velocities from the pressures as recorded on indicator diagrams. The effects of different rates of combustion on engine performance are also discussed, and the importance of proper spark advance is emphasized.

From a theoretical standpoint, from the analysis of indicator cards, and from observation of actual engines, it is considered evident that the time required for complete combustion of a charge varies considerably with different engine designs and operating conditions. It is also known that the rate of burning at any particular instant after ignition may differ even in cases where the total combustion time is the same. Both the rate of combustion and the time required for complete burning of the charge have an effect on the power and economy of the engine. The greatest power and economy are attained in the theoretical case of instantaneous combustion at upper dead center.

The slower combustions obtainable in practice may result in considerably reduced efficiencies if improperly timed with respect to piston position. However, the maximum theoretical performance may be approached very closely with a wide range of combustion times and rates, provided the proper spark advance is maintained for each particular condition.

Gaseous explosions, IV, V, G. G. BROWN and G. B. WATKINS (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 363-369, figs. 5*).—The fourth and fifth contributions to the subject are presented (*E. S. R., 57, p. 777*).

IV. *Rate of rise of pressure, velocity of flame travel, and the detonation wave* (pp. 363-366).—Velocity of flame travel and rate of rise of pressure are shown to be similar and to vary in the same way with changing initial conditions. Detonating mixtures of pure liquid fuels and substantially theoretical oxygen were exploded with various amounts of nitrogen in the constant volume bomb. The amount of nitrogen necessary to reduce the intensity of the detonation to an arbitrary standard was found to vary directly as the rate of rise of pressure. The conclusion is drawn that the rate of rise of pressure upon the explosion of a fuel mixture is the major factor indicating the tendency of that fuel mixture to set up the detonation wave in a progressive homogeneous reaction, and that engine knock is not due to a detonation wave as recognized in progressive homogeneous explosions.

V. The probable mechanism causing "detonation" in the internal combustion engine (pp. 366-369).—It was found that, if the maximum rate of rise of pressure as determined in a progressive homogeneous reaction under constant initial conditions be divided by the autoignition temperature on the absolute temperature scale, a number is obtained which varies directly as the knocking tendency of that particular fuel in an engine. This fact suggests that rate of rise of pressure and autoignition temperature are the two factors determining the tendency of fuels to knock, and that autoignition of the unburned mixture adiabatically compressed against hot surfaces is the mechanism causing fuel knock in an internal-combustion engine.

Cotton picking by machinery, R. THOMAS (*Empire Cotton Growing Rev.*, 4 (1927), No. 4, pp. 352-364, pls. 3).—An account is given of mechanical cotton picking operations as observed by the author in different countries, particularly the United States. In the last instance, the work in snapping and sledding cotton is especially described. The opinion is expressed that the time is not far distant when a large and steadily increasing percentage of the world's cotton crop will be machine made.

Operating the ensilage cutter with electric motor, O. E. ROBEY and E. C. SAUVE (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 37-39, fig. 1).—Data on power costs of operating ensilage cutters with electricity are briefly presented. They indicate that the cost per ton varies between 65 and 99 cts. The best speed of operation was found to be from 525 to 550 r. p. m.

Laboratory tests of orchard heaters, A. H. HOFFMAN (*California Sta. Bul.* 442 (1927), pp. 37, figs. 15).—The results of tests of 19 orchard heaters, including a high and a low test in the open and a normal test indoors, are reported.

In general it was found that the methods commonly used by mechanical engineers for testing the performance characteristics of steam boiler furnaces and the like are inapplicable to orchard heaters for the reason that the latter, burning in the open, present an entirely different problem. It was therefore necessary to devise entirely new methods and apparatus.

The burning rate was found important, since it governs the rate of heat production. Each type of heater, if left without readjustment, was found to have a characteristic burning rate curve, the shape of which was altered by changes in wind velocity and air temperature and in temperature and volatility of the fuel. The burning rate is adjustable in most heaters. Too high a rate was found undesirable, since it tends to increase smoke and losses by radiation and by gases rising too high. It also tends to cause rapid scaling off and destruction of the stacks. Frequent and careful regulation is desirable as a means of overcoming the smoke nuisance as well as of securing the desired heat production.

From the standpoint of heat distribution and reduction in the amount of smoke, it was found better to light all of the heaters and burn them at a low rate with frequent regulation than to light only a portion at first and to light others as the night grows colder. This frequent regulation was found to control the burning rates of the heaters in such a way as to save considerable fuel. With briquet heaters the most practical method of controlling the burning rate is to start with a relatively small fuel charge and refuel at about 2-hour intervals throughout the night.

All of the heaters were found to be practically 100 per cent efficient from the standpoint of converting fuel into heat. There was almost no carbon monoxide in the gases, and the heat lost in the unconsumed carbon of the smoke was in every case less than 0.1 per cent of the total heat in the fuel used. The

heat radiated above the horizontal plane ranged from about 1 to nearly 5 per cent of the total heat in the fuel. Not all of this radiated heat is lost, since the portion that strikes leaves, twigs, or other opaque objects and is absorbed was found to warm the air. Baffles for decreasing the radiation loss were found practicable.

High upward velocities and high temperatures tended to waste fuel by sending the hot gases to high levels above the orchard. The velocities found were satisfactorily low except in high stack heaters not equipped with a horizontal baffle plate. Velocities as high as 14 ft. per second were found in some of these.

Smoke was found to be of little or no benefit as a blanket to prevent radiation. The lard pail heaters were the worst offenders in this respect. A number of the later oil burners were practically smokeless when burned at normal and low rates, but all smoked some when burning at very high rates. Oils, being higher in heat content per pound, were found to be more effective than solid fuels. High sulfur content in fuels was found to be objectionable, and high viscosity and rapid increase in viscosity when the temperature decreases make an oil unsuitable for nondistilling type heaters.

The electric brooder, B. D. MOSES and T. A. WOOD (*California Sta. Bul.* 441 (1927), pp. 39, figs. 21).—The results of investigations on brooders heated by electricity in actual field operation are reported.

When radiation is depended upon as a method of heat transfer and the elements are operated at glowing temperature, the hover is generally from 3 to 4 ft. high, no curtains are used, and little or no trouble is experienced from sweating. The heating cost at 2 cts. per kilowatt hour was found to average from about 2.5 to 3 cts. per chick per 1,000 hours. It was found that for mild climates 2 watts should be allowed per chick, but where freezing temperatures are experienced from 2.5 to 3 watts should be available.

In brooders using radiation but equipped with elements that do not glow, the hover is low, usually has curtains, and has some special provision for taking care of air replacement. The operation cost was found to be somewhat lower than with the glowing type. The heaters should have a capacity of from 1.5 to 2 watts per chick.

The brooders depending upon convection usually heat some or all of the incoming air, may or may not use curtains, may use either the glowing or nonglowing elements, are comparatively free from sweating troubles, and cost from 0.75 to 1 ct. per chick per 1,000 hours to heat. The open, or curtainless, type of hover requires more heat than the closed, or curtain, type, but it has better ventilation.

Seven square inches is the brooder floor area recommended per chick.

Study of air velocity and temperature in vegetable dehydration, A. W. CHRISTIE and K. MATSUMOTO (*Jour. Amer. Soc. Heating and Ventilating Engin.*, 33 (1927), No. 6, pp. 381-386, figs. 3).—The results of comparative experiments conducted at the California Experiment Station on the dehydration of carrots, cabbage, and peas are reported.

A temperature of 160° F. was found to be approximately the highest safe temperature for the dehydration of carrots and peas, while for cabbage the temperature should not exceed 150°. While higher temperatures increase the rates of drying, they result in injury to the products. Air velocities in excess of 500 ft. per minute were found to increase slightly the rates of drying but showed a tendency to injure the quality of the products. An air flow of 500 ft. per minute at a temperature of 160° gave the most economical use of heat.

Comparative tests of radiator finishes, W. H. SEVERNS (*Jour. Amer. Soc. Heating and Ventilating Engin.*, 33 (1927), No. 1, pp. 23-28, figs. 3).—Studies

conducted at the University of Illinois are reported from which the conclusion was drawn that a certain standard radiator with a certain standard finish must be made the basic standard of comparison for tests of radiator finishes.

It was found that the color and chemical composition of the finish pigments and the vehicle used to carry the pigments of the basic finish must be defined if results are to be useful. The color of the pigment is apparently not so important as the chemical composition of the finish pigments and the vehicle used to carry them. It was further found that the reduction of the heat transmitted by a radiator coated with aluminum bronze is not as much as 25 per cent, as widely reported for all classes of radiators, but that it may range from about 18 per cent for special and very effective radiators down to 9 per cent or less for wider and higher column type steam radiators.

RURAL ECONOMICS AND SOCIOLOGY

[*Agricultural economics research at the Missouri Station, 1926-27*] (*Missouri Sta. Bul.* 256 (1927), pp. 33-40).—The results of investigations in agricultural economics not previously noted are reported as follows:

The agricultural and market value of Missouri farm lands, O. R. Johnson (pp. 35, 36).—A study of the indexes from 1891 to 1923, inclusive, of land values in Missouri, farm wages in the United States, Chicago corn prices, and wholesale prices showed that under normal conditions land prices follow the general price trend, with a lag of from 2 to 5 years. In periods of inflation the lag is only 18 months, and in periods of deflation there is no lag. The relation between land values and farm wages was found to be close. A very marked relation was found to exist between the income index and land value. Crop index was a slightly poorer measure of land value.

General plans of farm organization and operation in different sections of the State, O. R. Johnson (pp. 37, 38).—A study of beef cattle feeding records in Saline County for 1920 showed that in periods of depression farmers must reduce their business to a minimum, and that the small farmer has the advantage over the large farmer. The temptation to continue heavy operation was greater on good land and resulted in greater loss.

Cost of family living on the farm, O. R. Johnson and B. H. Frame (p. 38).—A table is given showing for 1924-1926 the expenditures for dry goods, groceries, miscellaneous household items, personal items, and the value of products furnished by the farm. Products from the farm constituted from 32.34 to 39.05 per cent of the total living expenses.

Tractors and other farm equipment costs on the farm, O. R. Johnson and B. H. Frame (pp. 38, 39).—The net cost divided into direct cash expenses and other expenses for farm equipment, other than tractors, trucks, or automobiles, and dairy, poultry, and other special equipment, on 14 farms studied in 1926 averaged \$172.32 per farm and 4.05 cts. per horse-hour.

Utilization of labor on the farm, O. R. Johnson and B. H. Frame (p. 39).—A table is given showing by crops the total hours and the average hours per acre of man labor and horse and tractor work used in producing corn, wheat, oats, soy beans, and cowpeas in 1926.

Farm cost accounting, O. R. Johnson and B. H. Frame (p. 40).—A table is given showing for 1925 and 1926 the total cost and the cost per farm of different items in the cost of horse labor. The cost per hour of horse labor was 11.61 cts. in 1925 and 11 cts. in 1926.

A farm management study in the [Michigan] corn borer area, E. B. Hill, R. V. GUNN, and G. W. COLLIER (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 41-45).—The results are included of a study made in cooperation with the

U. S. D. A. Bureau of Agricultural Economics on 250 farms in 4 typical sections in 4 counties in southeastern Michigan. Changes in the acreage of corn from 1926 to 1927 and the time required in 1927 to make a satisfactory corn borer clean-up of the 1926 cornfields are discussed.

The average amount of extra labor and power needed to prepare 10 acres of corn land for spring crops, including barn and lot clean-up, in the 4 sections varied as follows: Man labor from 55.2 to 72.4 hours, horse work 33.1 to 51.9 hours, and tractor work from 2.3 to 7.9 hours. A table is given showing typical amounts of labor and power required to prepare corn land for crops, using different practices, under normal and control methods. The reduction in the acreage of corn from 1926 to 1927 were 1, 14, 23.5, and 23.5 per cent, respectively, in the 4 sections.

A study of the organization and management of dairy farms in north-eastern Iowa, A. MIGHELL (*Iowa Sta. Bul. 243 (1927)*, pp. 49-104, figs. 29).—This bulletin presents a business analysis of 239 farms in Bremer and Fayette Counties, Iowa, for the year ended February 29, 1924. The results of variation in organization and farm practice in growing corn, oats, and hay; using land for pasture; dairying; and raising hogs, cattle, sheep, and poultry; and the effects of size and flexibility in organization and operation, rent, equipment expense, and efficiency in organization and management upon profits are discussed.

The average size of farm was 150 acres, of which 27 per cent was in corn, 22 per cent in oats, 16 per cent in hay, and 29 per cent in pasture. The average gross income per farm was \$3,339, of which 5.7 per cent was from crops, 42.7 from cattle and dairy products, 27.6 from hogs, 10 from poultry, 2.8 from increases in inventory, and 9.7 per cent from house rent. The average profit per farm for the 239 farms, after making deductions for return on investment in land, buildings, operating capital, and for the labor of the operator and his family, was \$43. The 15 most profitable farms yielded an average profit of \$1,336, and the loss on the 15 least successful farms averaged \$1,323.

Larger profits were obtained on farms having from 20 to 35 per cent (from 27 to 36 per cent for farms having 60 acres or more) of the acreage in corn, from 20 to 30 per cent in oats, a low percentage in hay, and from 25 to 30 per cent in pasture. On farms having less than 30 acres in corn, the most profitable ratio between pork and butterfat production was about 5 lbs. of pork to 1 lb. of butterfat. On farms having over 75 acres in corn, the most profitable ratio was 8:1. Hogs returned \$48, dairy cattle \$56, and poultry \$62 profits for each additional \$100 worth of products produced above the average for the 239 farms. Mixed dairy and dual purpose herds produced \$1.03 and dairy herds \$1.56 more per cow than dual purpose herds. Each increase of 1 lb. of butterfat per cow increased the average returns above feed cost per cow 45 cts. Total farm profits continued to increase with increased butterfat production per cow, notwithstanding total receipts from the herd did not increase after the average butterfat production per cow reached 220 lbs. Except for a small decline in the 75-100 per cent class in pounds of butterfat and returns above cost of feed per cow, the pounds of butterfat and returns above feed cost per cow and the profits from total farm business increased with each 25 per cent increase in the number of cows freshening in the fall.

Cattle ranching in Utah, W. PETERSON, P. V. CARDON, K. C. IKELER, G. STEWART, and A. C. ESPLIN (*Utah Sta. Bul. 203 (1927)*, pp. 56, figs. 5).—This bulletin presents the results of a study made in cooperation with the Bureau of Agricultural Economics and Animal Industry, U. S. D. A., for the purpose of obtaining information pertaining to organization, practices, economic status, and the outlook of typical range livestock ranches of Utah. It is based upon

records of operations for the calendar year 1925 from 55 strictly range cattle ranches. Tables are included showing the amounts of land owned, leased, cropped, etc.; the distribution of ranch investment between land, improvements, equipment, range cattle, work stock, other livestock, and feed supplies; the ranch indebtedness; the inventory of stock at the beginning of the year, and the purchases, sales, death losses, etc., during the year; the labor requirements, kinds of labor used, and value of labor; the distribution of ranch expenses; the distribution of ranch receipts; and a financial summary of the ranches studied.

The data in the several tables are presented for two divisions, (A) the 36 ranches having no winter use of the public domain, and (B) the 19 ranches making winter use of the public domain. The data for each division are subdivided into groups as follows: Group 1, ranches having less than 100 breeding cows; group 2, ranches with 101 to 200 breeding cows; and group 3, ranches with 201 to 500 breeding cows. Four ranches in division B fell into a fourth group having over 500 breeding cows. The percentages of return (net receipts less value of operator's labor) on total investment were -0.8 , 2.9 , and 5.8 , respectively, for groups 1, 2, and 3 of division A, and -0.3 , 3.1 , 7 , and 8.5 , respectively, for the four groups of division B. Disregarding the increases in market value during the year, the percentages of return were -3.5 , -0.1 , and 2.7 , respectively, for the groups of division A, and 2.5 , 1.9 , 6.4 , and -6.7 , respectively, for the groups of division B.

Correlation studies indicate that profits tended to increase as the number of cows and the number of all cattle increased and to decrease as the percentage of total investment represented by cattle decreased; that high land investment did not tend uniformly to yield high profits; that efficiency in the use of labor varied considerably on the different ranches; that there is a tendency for ranches making good profits to have other sources of income than cattle; and that there appeared to be a general lack of correlation between the percentage of calf crop and the percentage of profits. Data are included on different phases of herd management on the ranches studied. Financial statements of two typical ranches are presented and analyzed.

Settlers' progress in dry-land farming in eastern New Mexico, E. O. WOOTON (*U. S. Dept. Agr. Circ. 4* (1927), pp. 43, figs. 2).—This bulletin presents the results of a study made during 1925 of farm organization and practices, capital investment, receipts, expenses, farm, operator, and family incomes, indebtedness, and degree of success of the farmers on 99 farms in Curry County and 97 farms in Roosevelt County, N. Mex.

Land valuation (*Missouri Sta. Bul. 255* (1927), pp. 79, figs. 9).—This bulletin consists of abstracts of the following lectures and addresses delivered at the first short course in land valuation held at the College of Agriculture of the University of Missouri, July 26 and 27, 1927: Soil Characteristics as an Index to Fertility, by M. F. Miller (pp. 3-7); Economic Factors Determining the Physical Security of Farm Loans, by O. R. Johnson (pp. 8-14); Regional and Local Factors Affecting Land Values and Methods of Appraising, by D. H. Doane (pp. 15-24); Economy of Operation as a Basis for the Orderly Retirement of the Loan Fund, by B. H. Frame (pp. 25-32); Some Farm Management Measures of Value in Land Appraisal, by D. C. Wood (pp. 33-41); Soil Improvement as a Factor in the Management of Foreclosed Farms, by M. F. Miller (pp. 42-45); Appraisal Problems of the Federal Land Bank, by H. P. Bestor (pp. 46-50); Recent Trends in Land Values and Some of the Causes, by H. C. Taylor (pp. 51-57); The Relation of Soil Type to Land Utilization and to Land Values, by H. H. Krusekopf (pp. 58-64); and A Method for the Disposal of Foreclosed Farms, by C. A. Helm (pp. 65-79).

Cooperative marketing for Missouri, F. L. THOMSEN and G. B. THORNE (*Missouri Sta. Bul.* 253 (1927), pp. 97, figs. 32).—This bulletin is based upon more or less complete data obtained regarding 60.2 per cent of all cooperative marketing organizations in Missouri and 53 of the 186 defunct organizations revealed by the investigation. It is intended to give a complete picture of the status and essential features of cooperative marketing in the State, to assist members and prospective members of such organizations in applying experiences of other organizations, and to furnish a guide to future research and other activities in cooperative marketing.

The growth, present status, kinds, distribution, etc., of cooperative marketing organizations in the State are described. The possibilities, limitations, and benefits of such organizations, the factors and conditions affecting their success or failure, the forms of organization, the problems of holding the cooperative membership, and the general aspects of management are discussed.

Egg marketing by farmers in Pennsylvania, F. F. LININGER (*Pennsylvania Sta. Bul.* 214 (1927), pp. 20, figs. 2).—This is a study of prices and costs of marketing based on 228 marketing records from 14 counties for the year ended June 30, 1926. Fifteen types of buyers and 29 ways of selling were reported. Comparison of prices received by 88 farmers showed that the average of the monthly prices per dozen for the year were 39.4, 40.8, 43.5, and 51.9 cts., respectively, according to whether sales were made to country stores, hucksters, New York wholesalers, or direct to consumers. The average costs per dozen of marketing by the different methods were 1.86, 0.58, 4.74, and 4.3 cts., respectively. The costs of the various items in marketing by the different methods are given. The average prices for house delivery sales were found to differ as much as 13.7 cts. per dozen between different counties.

Receipts of food by rail and water in Providence, Rhode Island, R. B. CORBETT (*Rhode Island Sta. Bul.* 211 (1927), pp. 15, figs. 3).—Data are included regarding the carload receipts from 1921 to 1925 by years, months, and commodities of perishable and staple food products received by rail and the carload equivalents of different commodities received by water in 1921, 1923, and 1925.

Crops and Markets, [November, 1927] (*U. S. Dept. Agr., Crops and Markets*, 4 (1927), No. 11, pp. 409-448, figs. 3).—Tables, graphs, reports, notes, and summaries of the usual type are included on cotton and other crops, livestock and livestock products, dairy and poultry products, feedstuffs, fruits and vegetables, grain, hay, seeds, cold-storage holdings, prices of agricultural commodities, and the world agriculture.

A list of international organizations interested in agriculture, compiled by K. JACOBS (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 22 (1927), pp. 16).—In this mimeographed list the date of foundation, place of meeting, president, and object are included for most of the organizations.

Young people's organizations as a factor in rural life, E. L. MORGAN and H. J. BURR (*Missouri Sta. Bul.* 256 (1927), pp. 85, 86).—A study was made to determine the extent to which young people's organizations are meeting the needs of young people as expressed by the young people themselves. Of the young people in high schools in four communities studied, 92 per cent had all their desires concerning religious things satisfied, 87 per cent desired more facilities for recreation, 61 per cent more economic opportunities, and 82 per cent more social activities. Very few of the organizations the purpose of which was service to young people were planned to serve the needs of young people, the organizations being primarily for and dominated by adults.

FOODS—HUMAN NUTRITION

Studies on the effects of abundant cereal intake.—I, The use of cereals as the chief source of calories. II, The use of supplements other than milk, G. R. COWGILL (*Jour. Amer. Med. Assoc.*, 89 (1927), Nos. 21, pp. 1770-1774, figs. 2; 23, pp. 1930-1932, fig. 1).—The author, with the assistance of M. H. Jones, R. A. Frisch, and G. P. Jackson, has conducted various feeding experiments on rats, using diets containing cereals in proportions considerably higher than is usually the case in American dietaries, together with simple supplements selected with the view to furnishing all dietary essentials, and has tested the adequacy of the various diets by the criteria of growth, skeletal and tooth development, blood count, evidence of vitamin deficiencies, reproduction, and lactation. The cereals used included rolled oats, whole wheat, yellow corn meal, and milled wheat breakfast food and hominy. All were cooked in water from 20 to 40 minutes, dried in a current of air at approximately 70° C., and ground to a powder.

In the first series of feeding trials the cereals were fed at five different levels to the extent of from 63 to 92.5 per cent of the diet, supplemented by decreasing amounts of meat residue as a source of additional protein, a small amount (in most cases 5 per cent) of dried cooked liver, Osborne and Mendel's salt mixture, and cod-liver oil, with 15 gm. of fresh lettuce per rat per day. With all of the cereal products except hominy, on which growth was slightly inferior, entirely satisfactory results were secured with the cereal furnishing as much as 84 per cent of the calories, and even with almost 93 per cent of the calories supplied by the whole grains the results approximated those of current normal standards.

The second series of experiments was planned to investigate still further the practicability of substituting other easily accessible foods for milk in diets in which 65 and 80 per cent, respectively, of the calories were furnished by the cereals used in the first study. Whole cooked egg and molasses were used as the supplementary foods, the former because of its content of good protein, calcium, phosphorus, iron, and vitamins A, B, and D, and the latter because of its high content of ash. Diets consisting of whole-grain cereals and other cereal products 65, egg 20, and cane molasses 15 per cent, with a daily allowance of 15 gm. of fresh lettuce, proved entirely adequate for rapid growth. On similar diets in which the cereal constituted 80 per cent of the diet, growth was not quite so satisfactory with the corn meal and the lactation records were not entirely satisfactory. When the cereal constituted 93 per cent of the diet, satisfactory growth was obtained with oatmeal and whole wheat but not with corn meal. The value of the 65 and 93 per cent cereal diets for lactation was not determined.

In the opinion of the author, the results obtained in these studies "demonstrate conclusively that cereals may be used by man to a much greater extent than is common in this part of the world, and that nutritive success with high cereal rations is primarily a problem of providing suitable supplements. Furthermore, these supplements, contrary to what seems to be the current belief, need not include milk."

Unusual meats, J. A. CLINE and R. S. GODFREY (*Missouri Sta. Circ.* 162 (1927), pp. 11, figs. 13).—Directions are given for the general preparation for cooking of brains, sweetbreads, liver, heart, tongue, kidneys, and pigs' feet, backbone, and spareribs, together with tested recipes in which these "unusual meats" are used.

Cooking beef according to the cut, L. M. ALEXANDER and F. W. YEATMAN (*U. S. Dept. Agr. Leaflet* 17 (1927), pp. 4, figs. 5).—Different cuts of beef are classified as tender and less tender cuts, with general directions for the proper cooking of each. Special cooking directions are also given for broiled steak and rib roast of beef as representatives of tender cuts and stuffed flank steak and

pot roast beef of less tender cuts. For roasting the use of special meat thermometers inserted in the roast is recommended.

A study of temperature and time of cooking on the quality and palatability of meat, J. A. CLINE and R. S. GODFREY (*Missouri Sta. Bul.* 256 (1927), pp. 74, 75).—A study of the quality and palatability of beef roasted at various temperatures, with and without searing, is reported briefly. Of the 10 methods used, roasting at constant temperatures of 230 and 325° F., respectively, for the entire period gave products judged the most palatable and at 425 and 500°, respectively, the least palatable. The meat roasted at 230° also scored highest in juiciness and tenderness and that at 425° lowest in tenderness. The only disadvantage in the results obtained at the constant low temperature of 230° was the lack of brown color due to lack of searing.

Studies in pubescent growth, with special reference to periodic gain, B. S. VEEDER and E. H. ROHLFING (*Amer. Jour. Diseases Children*, 34 (1927), No. 2, pp. 211-217).—Height and weight records over a period of 6 years of a selected group of boys between the ages of 10 and 18 years attending the St. Louis Country Day School have been analyzed. The boys were all native-born and as a rule of native-born parentage for several generations, and were of superior health and intelligence. The records of 704 boys were used in studying annual increments in height and weight, of 534 in studying the seasonal periodic gains, of 830 for a weight-for-height table, and of 641 for a weight-for-chest circumference table.

"The average annual growth in weight and height corresponds closely to the figures of previous studies. In the group between 10 and 14 years, the gain is fairly evenly distributed throughout the year. From 14 to 18 years, the gain is chiefly in the period of October to January, inclusive. Little gain takes place in the latter group during the summer vacation months. The period of maximum gain occurred in the fall months for 40 per cent and in 25 per cent in the summer months (chiefly boys under 14), and in only 5.5 per cent was the gain fairly uniform throughout the year. Only 5 per cent lost weight in the fall months as contrasted with 18 per cent in the summer months"

The weight-height and weight-chest circumference standards established corresponded more closely with the tables of Gray (*E. S. R.*, 46, p. 563) than with the Baldwin-Wood standards, and showed very close agreement with the new table of Gray and Fraley, based on 1,016 boys in private schools in the East (*E. S. R.*, 56, p. 394).

The relation of diet to bodily activity and to capacity to withstand unfavorable circumstances, A. G. HOGAN, J. E. HUNTER, and C. L. SHREWSBURY (*Missouri Sta. Bul.* 256 (1927), pp. 50, 51).—In continuation of the series of studies previously noted (*E. S. R.*, 54, p. 758), a comparison has been made of the growth records of six pairs of rats (litter mates) on rations differing only in the presence or absence of vitamin E. No difference in growth rate attributable to vitamin E could be detected.

Muscular activity, A. V. HILL (*Baltimore: Williams & Wilkins Co.*, 1926, pp. [6]+115, figs. 47).—The several lectures here presented, which constitute the sixteenth course of the Herter lectures delivered at Johns Hopkins University in 1924, deal with the dynamics of muscular activity, the heat production of muscle, the chemical changes accompanying muscular activity, and the recovery process after exercise in man. Bibliographies accompany the lectures.

The protein intake of medical students, H. H. BEARD (*Amer. Jour. Physiol.*, 82 (1927), No. 3, pp. 577-579).—The conclusion of Denis and Borgstrom (*E. S. R.*, 52, p. 761) and other investigators at Tulane University, New Orleans (*E. S. R.*, 56, p. 602), that the protein intake in the South is much smaller than that in the North, and that this is due to increased temperature, is thought to be refuted by the results obtained in 400 24-hour urine analyses of male medical

students at Western Reserve University, Cleveland, Ohio. The determinations were made during the month of January from 1922 to 1927, inclusive. The total nitrogen eliminated by the 400 subjects varied from 5.97 to 18.76 gm. daily, with an average of 11.16 gm. during a mean temperature range of 24 to 30.2° F. This amount of nitrogen corresponds to 76.7 gm. protein per 70 kg. body weight, after adding 10 per cent for that lost in the feces, and is practically the same as that reported by the southern investigators.

The protein requirement of adult man (*Jour. Amer. Med. Assoc.*, 96 (1928), No. 1, pp. 32, 33).—This editorial comment, occasioned by the paper noted above, includes a brief summary of the various standards of protein intake advocated from the time of Voit to the present day. It is considered significant that the healthy youth of the present time, as represented by the average student of medicine, has become adjusted to a protein consumption not exceeding 80 gm. daily.

Seasonal variation in the calcium content of infants' serum, H. and R. M. BAKWIN (*Amer. Jour. Diseases Children*, 34 (1927), No. 6, pp. 994-999, figs. 3).—Determinations of the blood calcium of a large number of sick and healthy babies from 3 to 24 months of age at monthly intervals from January, 1926, to March, 1927, inclusive, with the exception of July, August, and September, showed a definite seasonal variation, the drop beginning during the late autumn, reaching the lowest point during the early spring months, and rising with the approach of summer. The values were consistently higher during the first three months of 1927 than of 1926, and the rise began earlier in 1927. Meteorological records showed more favorable weather conditions during February and March in 1927 than in 1926 in New York City, where the observations were made. The number of infections during this period was also less.

Inorganic blood phosphate: Studies of rats on rachitic and nonrachitic diets, E. M. KOCH and M. H. CAHAN (*Amer. Jour. Diseases Children*, 34 (1927), No. 2, pp. 187-197).—This is a complete report of an investigation previously noted from a preliminary report (*E. S. R.*, 57, p. 792).

Vitamin A deficiency and urolithiasis, E. C. VAN LEERSUM (*Brit. Med. Jour.*, No. 3488 (1927), pp. 873, 874).—The author has examined for urinary calculi 886 rats, 645 of which had been fed a diet deficient in vitamin A. In none of the rats on diets furnishing adequate amounts of vitamin A were calculi found, while in 197 of those on the vitamin A-deficient diet were found calculi consisting of calcium phosphate or a mixture of calcium phosphate and calcium oxalate. In some cases these were formed in as short a time as 3 or 4 weeks. An examination of the kidneys of 76 rats receiving a sufficient supply of vitamin A and 178 suffering from vitamin A deficiency showed lime deposits in the tubules but none in the glomeruli in 10 of the first group and 158 of the second. The deposits were very small in number and size in the first group.

These results are in harmony with earlier observations of Osborne and Mendel on the connection between vitamin A deficiency and appearance of urinary calculi, rather than the statement of McCollum that the calculi have occurred so frequently in animals whose diets contain an abundance of vitamin A that they should be considered as one of the results of general debility rather than vitamin A deficiency.

The oxidative destruction of vitamins A and E and the protective action of certain vegetable oils, H. A. MATTIL (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 18, pp. 1505-1508).—The literature on the apparent destruction of vitamin E in the presence of such fats as lard is reviewed, and a series of experiments is reported in which an attempt was made to discover the cause of this destruction.

Several composite rations used in sterility studies and mixtures of simple fats were first tested for susceptibility to oxidation by the method of Greenbank

and Holm (E. S. R., 54, p. 111). The results indicated that the presence of wheat germ oil in place of lard in the sterility ration renders it much less susceptible to oxidation, that the rapid oxidation of cod-liver oil is hastened by the presence of traces of ferrous sulfate and retarded by traces of wheat germ oil, that butterfat is less rapidly oxidized than cod-liver oil, and that the oxidation is checked by the presence of traces of wheat germ oil. The Kreis peroxide test, as described by Powick (E. S. R., 50, p. 609), was negative with butterfat oxidation products containing traces of wheat germ oil but strongly positive in products not thus protected.

On the theory that the protective action might be attributed to a high acetyl value representing hydroxyl groups, the acetyl value of wheat germ oil was determined and found to be 14.4, corresponding closely to other vegetable oils and relatively higher than animal fats and oils, particularly lard and cod-liver oil. The removal of hydroxyl groups from wheat germ and cottonseed oils appeared to decrease their power as antioxidants. The significance of these results is summarized as follows:

"Depending on the presence of catalysts of various kinds, or of antioxidants, the amount of vitamin E present in an individual foodstuff or in ration mixtures remains unimpaired for shorter or longer periods. Whether the oxidative changes that condition its destruction may take place in the alimentary tract after the ration has been consumed, as well as during its preparation or in containers before its ingestion, remains to be determined. Obviously the assay of foodstuffs for their content of vitamin E has been a resultant of (1) the actual amount of E present and (2) the kind and amount of antioxidants associated with it."

Basal metabolism in vitamin B starvation. S. OKADA, E. SAKURAI, T. IZUKI, and H. KABESHIMA (*Arch. Int. Med.*, 40 (1927), No. 3, pp. 292-313).—The conflicting literature on the subject is reviewed in considerable detail, including several papers from Japanese journals, and data are reported on basal metabolism determinations conducted on normal and beriberi human subjects subsisting on diets deficient in vitamin B to a greater or lesser extent.

In the patients with beriberi, vitamin B starvation was followed by an aggravation of the beriberi symptoms and a decrease in the basal metabolism and administration of vitamin B by amelioration of symptoms and an increase in the basal metabolic rate. Prolonged vitamin B insufficiency, but not absolute lack, in healthy persons resulted in the development of typical symptoms of vitamin B deficiency accompanied by a decrease in the basal metabolic rate, especially at the beginning of the manifestation of symptoms, and administration of a vitamin B preparation cured the symptoms and increased the rate of metabolism.

The authors are of the opinion that the decrease in metabolism can not be attributed to starvation, since it was noted while the patients were still consuming a normal amount of food. They also incline to the view that beriberi is not identical with the avitaminosis resulting from lack of vitamin B, chiefly from the observation that in straight beriberi the basal metabolism is usually normal.

Vitamin E.—II, The destructive effect of certain fats and fractions thereof on the antisterility vitamin in wheat germ and in wheat germ oil. H. M. EVANS and G. O. BURE (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 19, pp. 1587-1590).—Continuing their investigation of the destructive action of certain fats on vitamin E (E. S. R., 57, p. 197), the authors report that rather definite amounts of lard, oleic acid, or any substance capable of neutralizing the effect of vitamin E are required for definite amounts of wheat germ oil as a source of vitamin E, and that the presence in fats of the destructive factor, termed by them the antivitamin, is associated with the development of rancidity.

Even good sources of vitamin E, such as butter and wheat germ oil, were found to become active antivitamin on the development of rancidity. The increase in destructive action did not, however, parallel the acid numbers of the fat.

In attempts to remove the antivitamin from the fats, it was found that recrystallized lard is less destructive than market lard, and that on neutralizing the free acids in oleic acid with potassium hydroxide and extracting the alkaline aqueous solution of the soaps with ether, most of the strong odor and activity are to be found in the ether extract representing the unsaponifiable fraction.

A study of the antirachitic factor in human and in cow's milk, A. F. HESS and M. WEINSTOCK (*Amer. Jour. Diseases Children*, 34 (1927), No. 5, pp. 845-853).—This paper, read at the 1926 meeting of the American Pediatric Society, reports the results obtained in a study of the relative antirachitic properties for rats of cow's milk and human milk and of various fractions of cow's milk.

On a low phosphorus rachitic diet, rats were protected against rickets by from 20 to 25 cc. daily of cow's milk, while with human milk of the same fat content, 4 per cent, from 25 to 30 cc. was required. The average inorganic phosphorus content of the blood of the animals after receiving the cow's milk was 5 mg. per cent, as compared with 1.5 mg. per cent for human milk. The difference in protection afforded by the two milks is attributed to the higher phosphorus content of cow's milk. Cream (20 per cent fat), fresh or oxidized, afforded nearly complete protection in 6 cc. and complete protection in 8 cc. daily doses; 12 cc. of upper third milk equivalent in total fat content to 6 cc. of cream conferred little protection; and skim milk was likewise ineffective except in doses as high as 100 cc. daily.

It is also noted that chicken liver and chicken fat, both from cutaneous tissues and from the region of the gizzard, are protective against rickets in doses of 0.5 gm. and 0.25 cc., respectively.

Seasonal variation of the antirachitic effect of sunshine, F. F. TISDALL and A. BROWN (*Amer. Jour. Diseases Children*, 34 (1927), No. 5, pp. 721-736, figs. 9).—This and the following two papers report a continuation of the investigation previously noted from a preliminary report (E. S. R., 57, p. 793).

The earlier study has been extended to include the months of December to May, inclusive, with results indicating that in the latitude of Toronto the sun's rays have a slight but definite antirachitic effect on rats during the months of December, January, and February, followed by a sharp increase about March 1, which continues until in April and May the antirachitic effect is approximately eight times as great as in December, January, and February. A comparison of the amounts of available sunshine during the same periods suggests that the increased antirachitic effect is due to an increase in the shorter and more effective rays rather than in the amount of those of the length present in winter sunshine.

Antirachitic effect of skyshine, F. F. TISDALL and A. BROWN (*Amer. Jour. Diseases Children*, 34 (1927), No. 5, pp. 737-741, figs. 4).—A further comparison of the antirachitic effect of sunshine and skyshine has led to the conclusion that the skyshine is approximately from one-half to two-thirds as effective as what is ordinarily called sunshine.

"In view of the antirachitic effect of skyshine, which does not cause 'sunburn,' it is of interest to note that the burning or reddening of the skin, which is usually taken as the unit of measurement of ultra-violet therapy, must now be regarded as an accompanying phenomenon which may or may not be a measurement of the amount of ultra-violet rays received."

Antirachitic value of the sun's rays through various special window glasses, F. F. TISDALL and A. BROWN (*Amer. Jour. Diseases Children*, 34 (1927), No. 5, pp. 742-752, figs. 11).—The various glasses tested—Vitaglass,

Vioray glass, and Corning special glass—proved capable of transmitting from 25 to 50 per cent of the effective rays of the sun (including skyshine), with no appreciable differences in the efficacy of the three glasses. Ordinary glass, the same glazed with special glass, and ordinary fly screen proved incapable of transmitting any effective rays. Skyshine alone through an open window was ineffective except immediately adjacent to the window.

It is concluded that the use of special glass during the winter months is probably of little value, but that its use in the latitude of Toronto is justified from about the first of March on, when the weather conditions prohibit the exposure of patients to the sun's rays.

Does the irradiation of cod liver oil increase its antirachitic potency? E. T. WYMAN, A. D. HOLMES, L. W. SMITH, D. C. STOCKBARGER, and M. G. PIGOTT (*Amer. Jour. Diseases Children*, 34 (1927), No. 5, pp. 753-764, figs. 12).—Cod-liver oil irradiated for 30 minutes under carefully controlled experimental conditions was found to have no greater antirachitic potency for rats, as judged by growth curves, blood calcium and phosphorus, and X-ray and histological examination of the bones, than the same oil before irradiation. The same oil after irradiation for 2 hours had a noticeably lessened antirachitic effect.

Effect of therapeutic doses of ultraviolet radiation on basal metabolism in children, I, II. M. E. FRIES and A. TOPPER (*Amer. Jour. Diseases Children*, 34 (1927), No. 2, pp. 159-175).—Evidence is presented in these papers that the basal metabolism of children is not altered appreciably by ultra-violet radiations in therapeutic dosage. In the first paper, by the senior author (pp. 159-165), the records are given of basal metabolism determinations made from 20 to 70 hours after treatment, and in the second paper (pp. 166-175) of determinations made immediately and 1, 2, and 6 hours after irradiation.

Rickets in the negro: Effect of treatment with ultraviolet rays. S. A. LEVINSOHN (*Amer. Jour. Diseases Children*, 34 (1927), No. 6, pp. 955-961, figs. 4).—Various statements in the literature which have helped to create the prevailing impression that light therapy is ineffective in the treatment of rickets in negroes are reviewed, and the report is given in considerable detail of a single case of severe rickets in a 2-year-old negro child cured solely by ultra-violet light therapy. With no more intensive treatment than is the custom (3 minutes at 30 in., increasing 1 minute daily to 15 minutes, and continuing at this dosage), healing began in 3 weeks and was complete in 6.

In explanation of the fact that in this case pigmented skin did not retard the curative action of the ultra-violet rays, attention is called to the fact that cholesterol is found in the epidermal cells superficial to the pigment and that, according to the present theory that ultra-violet rays exert their antirachitic effect by activating the cholesterol of the skin, the rays do not have to penetrate the pigment to be effective.

Blood regeneration in severe anemia, X, XI (*Amer. Jour. Physiol.*, 83 (1927), No. 1, pp. 60-83).—In continuation of the series of studies previously noted (E. S. R., 57, p. 795), two papers are presented.

X. Assimilation and conservation of bile pigments, blood hemoglobin, and muscle hemoglobin. G. H. Whipple and F. S. Robscheit-Robbins (pp. 60-75).—Observations from previous studies and new data are reported on the ability of the body to utilize for blood regeneration bile pigment and blood and muscle hemoglobin introduced in various ways. These observations show that dogs rendered anemic by bleeding as described in earlier papers of the series are able to utilize as much as 80 to 90 per cent of blood hemoglobin introduced intraperitoneally or intravenously, but only from 5 to 20 per cent by ingestion. A pancreatic digest of dog red blood cells given intravenously in severe experimental anemia was utilized to the extent of 40 per cent. Muscle hemoglobin,

when given intravenously, was not well tolerated, but it was thought probable that some of it was utilized to build new red cell hemoglobin. No evidence was obtained of the utilization of bile pigments.

XI. Iron effect separated from organ effect in diet, F. S. Robschelt-Robbins and G. H. Whipple (pp. 76-83).—Attention is called to the present confusion in the field of experimental anemia. This is attributed chiefly to differences in the experimental conditions in the various studies reported, particularly the use of different species of animals and different methods of producing anemia. Observations of the authors are cited to show that small amounts of iron salts added to the diet may or may not cause an increase in blood hemoglobin over that of the control period, depending upon the actual shortage of iron at the time of feeding. It is also shown that the amount of hemoglobin regenerated by a large dosage of iron salts is increased to a marked extent by additional feeding of kidney or spleen. This is thought to indicate that the favorable action of kidney or spleen is not attributable solely to its iron content.

Iodine content of some water supplies in goitrous regions, G. H. BECKWITH (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 2, p. 117).—A tabulation is given of the iodine content of the drinking water of several goitrous regions, chiefly in Illinois. With one exception the iodine was uniformly low, ranging from 0.014 to 1.33 parts per billion. The exception was water from drift wells at La Salle, Ill., with an iodine content of 18 parts per billion. It is stated that there is less goiter among the people drinking water from these drift wells than from another source of supply in the same locality.

MISCELLANEOUS

Opportunities for a career in scientific research (Washington, D. C.: Natl. Research Council, Div. Ed. Relat., 1927, pp. [144], fig. 1).—This volume assembles 16 papers prepared for the National Research Council "for the purpose of presenting to college and university students the opportunities for a career in research in one of the various fields of the biological and physical sciences." The field of agriculture is covered in a chapter entitled *Agricultural Research as a Career*, by E. D. Ball, reprinted with slight changes from another source.⁴ Botanical research is discussed by J. M. Coulter, chemistry by W. D. Bancroft, engineering by A. A. Potter, forestry by H. S. Graves, public health by D. L. Edsall, and zoology by C. E. McClung.

Editorial policy regarding the Journal of Agricultural Research (*U. S. Dept. Agr., Misc. Pub. 3* (1927), pp. 8).—A general statement as to the nature and scope of the *Journal* is followed by suggestions for the preparation of manuscript and related information.

Directory of field activities of the Bureau of Plant Industry (*U. S. Dept. Agr., Misc. Pub. 1* (1927), pp. II+83, fig. 1).—This directory is arranged by States.

Thirty-fifth Annual Report [of Alabama Station, 1924], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1924*, pp. 18).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1924. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Report of the Alaska Agricultural Experiment Stations, 1926, C. C. GEORGESON (*Alaska Stas. Rpt. 1926*, pp. [2]+40, figs. 9).—This contains the organization list and a report of the several lines of work carried on. Meteorological

⁴ Science, 57 (1923), No. 1482, pp. 597-601.

logical data and accounts of the extensive tests with field and garden crops are abstracted elsewhere in this issue.

Annual report of the director for the fiscal year ending June 30, 1927, C. A. McCUE ET AL. (*Delaware Sta. Bul.* 152 (1927), pp. 54, figs. 7).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1927, and departmental reports. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Solving farm problems by research: One year's work [at the Missouri Station], July 1, 1926, to June 30, 1927, F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul.* 256 (1927), pp. 103, figs. 14).—This contains the organization list, a report on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1927. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly bulletin, [November, 1927], edited by R. S. SHAW and A. J. PATCH (*Michigan Sta. Quart. Bul.*, 10 (1927), No. 2, pp. 33-75, figs. 14).—In addition to articles abstracted elsewhere in this issue, this number contains the following: O. A. C. No. 104 Wheat Yields Well in Trials, by E. E. Down and H. M. Brown, and Simple Electric Farm Water Systems, by H. J. Gallagher.

NOTES

Florida University and Station.—Dr. Albert Alexander Murphree, president since 1909, died December 20, 1927, at the age of 57 years. He was a native of Alabama and a student at several southern institutions, receiving the A. B. and A. M. degrees from the University of Nashville and that of doctor of laws from Rollins College and the University of Alabama. His entire life had been spent in teaching and educational administration, beginning with rural schools in Tennessee in 1887 and including a period from 1895 to 1909 as president of the Florida State College for Women. As an administrator and educator he was widely recognized as very successful, and material development took place in both Florida institutions under his long leadership.

Dr. Owen Francis Burger, plant pathologist of the station since 1920, died January 26 from injuries received in an automobile accident near West Palm Beach. Dr. Burger was born in Freeland, Pa., June 8, 1885, but received his early education in Indiana, graduating from Indiana University in 1909. Subsequently he received the M. S. degree from the University of Florida and Harvard University and the D. Sc. degree from the latter institution in 1916. He was instructor in plant pathology at the Citrus Substation of the University of California from 1916 to 1918 and pathologist in the U. S. D. A. Bureau of Plant Industry from 1918 to 1920. He was closely identified with the activities of the State Plant Board, a member of a large number of scientific societies, and the author of many bulletins and other publications on diseases of fruits and vegetables.

Iowa College and Station.—*Iowa Agriculturist* announces that W. B. Ward, assistant professor of horticulture, has resigned to accept a position at Purdue University. Dr. L. W. Erdman, assistant chief in soil bacteriology in the station, has accepted an appointment as professor of soils in the University of Maryland, beginning January 1.

Kansas College and Station.—A new curriculum in home economics, designed for those wishing special training in applied art and with stress on courses in sketching design, costume design, and interior decoration, has been added. A new department has also been organized in the division of home economics to be known as the department of child welfare and euthenics.

J. G. Willier, assistant in plant breeding in the cooperative investigations of the U. S. D. A. Bureau of Plant Industry, has resigned to engage in commercial work.

Nebraska University.—A recent analysis of the university income and disbursements shows that in 1926-27, 61 per cent of the total income was derived from State funds, 33 per cent from student fees and departmental receipts, and 6 per cent from Federal funds. The disbursements included 52 per cent for instruction, 13 per cent for the station and extension work, 19 per cent for capital extension, 11 per cent for commercial activities, and 5 per cent for special activities.

Nevada Station.—V. E. Spencer, associate in soil fertility in the Illinois Station, has been appointed associate professor of soils research, beginning April 1.

New Hampshire University.—Immediate construction of a new chemistry building to cost \$350,000 has been authorized by the board of trustees. The establishment of a department of agricultural economics in charge of M. Gale Eastman has also been authorized.

Eugene T. Sherburne of Manchester, Richard W. Sulloway of Franklin, and William H. Caldwell of Peterboro have been succeeded on the board of trustees by Robert T. Kingsbury of Keene, James A. Wellman of Manchester, and John W. Pearson of Concord.

Oregon College.—Bids have been asked for a new men's dormitory to accommodate 320 students. This will be a three-story brick structure with a five-story central tower, and will cost, with equipment, from \$350,000 to \$400,000. It will replace the converted war barracks in use for the past decade, and is expected to be self-supporting at substantially the same rate to students as is now obtainable in private families.

Tennessee University.—Following the voting of bond issues of \$100,000 each by Weakley County and the city of Martin for the purchase of land and the erection of buildings and the appropriation by the State legislature of \$75,000 per annum for maintenance, the plant of the Hall-Moody Junior College at Martin has been acquired by the university as a junior college for west Tennessee. This college is to be an integral part of the university, administered by an officer immediately responsible to the dean of the College of Agriculture and with its faculty as members of the university instruction staff.

The buildings acquired include an administration building, a science building, two dormitories, a gymnasium, and a dining hall. The original campus of 11 acres has been supplemented by the purchase of 120 acres of adjoining farm land. Excavation for a home economics building and another science building is under way, and plans have been made for the early erection of a new and modern group of industrial arts and farm buildings.

Vermont University and Station.—*School and Society* notes that Albert H. Gilbert, assistant professor of botany and associate plant pathologist has resigned, effective July 1, to become professor of plant pathology and head of the department at Macdonald College.

New Journals.—*The Journal of the Ministry of Agriculture for Northern Ireland* is being issued as an annual to "provide a medium for the publication of the results obtained by the different research divisions attached to the Ministry." The initial number contains original articles dealing with experiments with phosphatic fertilizers, loss of vigor in potato stocks, the control of American gooseberry mildew, the cutting of Majestic seed potatoes, silage investigations, the value of mineral supplements to the breeding sow, and mineral supplements and vegetable protein in bacon production, together with numerous bibliographical reviews and short notes.

Archief voor de Theecultuur in Nederlandsch-Indië is being published by the Dutch East Indies Tea Experiment Station at Buitenzorg, Java, as a successor of the Reports of the Tea Station and the periodical *De Thee*. The initial number contains two technical articles, both with English summaries, the first being entitled Report of a Tour through British India in Connection with the Helopeltis Problem, by A. J. Garretsen, and the other The Black Root Fungi in Tea, by A. Steinmann.

Agricultural History is being issued quarterly by the Agricultural History Society. The initial number is largely devoted to a reprint from the *North Carolina Historical Review*, entitled The Movement for Agricultural Reorganization in the Cotton South during the Civil War, by E. M. Coulter.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The kinetics of protein denaturation, I-III, P. S. LEWIS (*Biochem. Jour.*, 20 (1926), No. 5, pp. 965-992, figs. 6).—Four papers have appeared in this series.

I. *The effect of variation in the H-ion concentration on the velocity of the heat denaturation of oxyhemoglobin* (pp. 965-977).—Concentrated homoglobin solutions practically free from salts were obtained by a procedure involving thorough dialysis at the isoelectric point of the protein. Such solutions, brought to various determined pH values by suitable dilution with water containing small quantities of either ammonium hydroxide or sulfuric acid and made to contain various definite concentrations of ammonium sulfate, were denatured under conditions permitting accurate observation in an apparatus designed to prevent concentration of the solution during the reaction. Samples withdrawn for analysis were made ice cold very rapidly after removal from the apparatus, and these samples, filtered free from coagulum, were used for residual hemoglobin estimations made with a biological colorimeter.

The denaturation rate as determined in these experiments was found to pass through a definite minimum at pH 6.76, measured with the quinhydrone electrode at 37° C. (the pH value at which the concentrations of the hydrogen and hydroxyl ions in the solution were equal), rather than at the isoelectric point of the protein (pH 6.5). The denaturation rate rose more rapidly on the acid than on the alkaline side of the pH of minimal rate. The critical increment of the process was found to be 77,500 calories. A discussion of thermodynamic considerations involved in the interpretation of the data obtained is included.

II. *The effect of variation in the H-ion concentration on the velocity of the heat denaturation of egg-albumin; the critical increment of the process* (pp. 978-983).—Results similar to those above noted with respect to homoglobin are here reported for egg albumin, the curve of the variation of the unimolecular constant of denaturation rate with changes in the pH value of the solution showing an asymmetry less pronounced than that observed in the corresponding data for hemoglobin. The critical increment of the heat denaturation of egg albumin was determined as 130,000 calories.

III. *The influence of neutral salts on the velocity of the heat denaturation of oxyhemoglobin* (pp. 984-992).—By methods essentially similar to those above noted, the influence of ammonium sulfate, sodium sulfate, and sodium chloride in various concentrations upon the denaturation rate of oxyhemoglobin at pH 6.76 as measured at 37° by means of the quinhydrone electrode was studied.

It is concluded that neutral salts apparently "have a dual effect. The first, predominating in lower concentrations of salt, acts so as to displace the mini-

imum of the curve k_{uni} [unimolecular velocity constant] against pH to one side. The second which predominates in higher concentrations, acts so as to displace this same curve downwards."

The results of this series of experiments are considered to bear out an hypothesis advanced in part 1 of these studies, and values of the critical increment of the heat denaturation of oxyhemoglobin calculated from the results obtained in the presence of ammonium sulfate are considered to be in good agreement with the values stated in part 1.

The fourth paper of the series is noted below.

The heat-denaturation of proteins.—Part IV, The free basic and acidic groups of fresh and denatured haemoglobin, P. S. LEWIS (*Biochem. Jour.*, 21 (1927), No. 1, pp. 46-53, figs. 2).—An attempt was here made to ascertain, by means of direct titration, whether or not any change in the number of basic and acidic groups in the protein molecules accompanies heat denaturation or coagulation. A method of Harris (*E. S. R.*, 50, p. 802) was used for the determination of the titratable basicity of the amino groups before and after heat denaturation, and for similar work on the titratable carboxylic acidity a modification of the Sørensen form of titration procedure was employed, titration curves being constructed in each case.

Heat denaturation was found to be without effect on the amount of the free amino or carboxyl groups, titration curves for the fresh and for the coagulated protein coinciding at all points in the cases both of the acidic and of the basic groups. This is considered confirmatory of the work of Harris (*E. S. R.*, 49, p. 501), who found no detectable change in the formaldehyde titration of egg albumin to take place when that protein was denatured, and to oppose the theory of Robertson (*E. S. R.*, 38, p. 708), which regards the coagulation of proteins as involving the condensation of contiguous carboxyl and amino groups. On the estimation of a molecular weight of 16,660 for hemoglobin, the presence of 24 or 25 free basic groups and of 16 free acidic groups is estimated from the data obtained, and the conclusion drawn from the investigation is that protein denaturation involves "the hydrolysis of linkages of a character analogous to those involved in the hydrolysis of polysaccharides, as distinct from rupture of the polypeptide link ($-\text{CONH}-$)."

The formation and decomposition of fats by microorganisms [trans. title], G. SELIGER (*Monog. Nauch. Inst. Im. P. F. Lesgafta [Leningrad]*, No. 1 (1926), pp. 111).—The monograph takes up the subject under the following chapter headings: (1) Fats in algae, bacteria, and fungi; (2) on the methods of the chemical analysis of fat; the cultivation of fat-decomposing organisms; microchemical reactions; extraction of fat; the constants which characterize fats; and reactions showing the decomposition of fat in microbial cultures; (3) the formation of fat in fungi and bacteria; and fat formation in relation to the composition of the medium; (4) fat as a nutrient for bacteria and fungi; fat-decomposing microorganisms and the nature of fat decomposition by microorganisms; the nutritive value of the component parts of fat; and lipase; (5) rancidity of fats and oils; and fat-decomposing organisms in food; (6) fat-decomposing microbes and cheese ripening; fat-decomposing organisms in the intestinal flora; the possible activity of fat-decomposing microbes in the tanning of skins; the decomposition of fat, and microbes which break down fats in soils, or irrigated fields, and in slimes; the decomposition of fats and the formation of carbohydrates; and the formation of adipocere in dead bodies; and (7) conclusion; theory and practice in the study of the problem of the formation and decomposition of fat by microbes; and problems to be studied.

Each chapter is accompanied with an extensive bibliography. A subject index is also given.

Modifications of cane sugar [trans. title], E. O. VON LIPP MANN (*Chem. Ztg.*, 51 (1927), No. 90, p. 873).—This is a very brief summary of observations indicating the existence of modifications of sucrose, one with melting points as low as 155° C., sp. gr. 1.5718, and heat of solution —813 calories, while another form is stated to have been assigned the melting point 189.3° and to have sp. gr. 1.5860 and a heat of solution of —1,095 calories. The latter form, the more stable at ordinary temperatures, is said to be obtained when sucrose is precipitated from aqueous solution by ethyl alcohol. When the form from methyl alcohol stands with saturated sugar solution or with ethyl alcohol at 30°, it is reported to revert to the more stable modification.

The constitution and synthesis of spermidine, a newly discovered base isolated from animal tissues, H. W. DUDLEY, O. ROSENHEIM, and W. W. STARLING (*Biochem. Jour.*, 21 (1927), No. 1, pp. 97–103).—A base allied to spermine and occurring in minute quantities in ox pancreas was isolated in yields of about 2 gm. of the phosphate from 100 kg. of the material, and several derivatives were prepared. The new base was given the name of spermidine, on account of its association with and constitutional similarity to spermine. In the synthesis of spermidine, α -(γ -phenoxypropylamino)- δ -aminobutane hydrobromide isolated as a by-product in the preparation of α : δ -bis(γ -phenoxypropylamino)-butane hydrobromide, required in the synthesis of spermine, was converted by heating in a sealed tube with hydrobromic acid into α -(γ -bromopropylamino)- δ -aminobutane hydrobromide, and this in turn, when heated in a sealed tube with a 16 per cent alcoholic solution of ammonia yielded α -(γ -aminopropylamino)- δ -aminobutane, the picrate, hydrochloride, chloroaurate, and *m*-nitrobenzoyl derivative of which were found to be identical with the corresponding derivatives of the new base as found to occur naturally. •

On the application of mixed indicators in acidimetry and alkalimetry [trans. title], J. M. KOLTHOFF (*Biochem. Ztschr.*, 189 (1927), No. 1–3, pp. 26–32).—The indicators ordinarily used in neutralization titrations show a gradual color change through an appreciable range of pH values. Only when the pH change at the end point of the titration is as great with the addition of one drop of the titrant as the entire range of the indicator used can a sharp color change from the full acid color of the indicator to the full alkali color, or vice versa, be obtained. Where weak acids or bases are involved, so that the pH change caused by the addition of a single drop of the titrant at the pH of chemical equivalents is not marked, it is necessary either to resort to a comparison solution having the pH of the correct end point of the titration and containing the indicator to be used, the titration in this case being carried as nearly as possible to a color match between titrated solution and pH standard, or to provide indicators showing a sharp color change within a very narrow and correctly placed pH range.

By suitable combination of two or more dyes, the author finds it possible in many cases to produce mixtures the color change of which takes place rather sharply at a definite pH value. Such mixed indicators may be prepared (1) by adding to the indicator another dye (not an indicator) having a shade almost complementary to that of one form of the indicator, or (2) by mixing indicators having about the same pH range, but producing more or less contrasting colors. As an example of method 1, a mixture of 1 per cent phenolphthalein and 0.2 per cent methyl green is described as green in acid solutions and beginning to turn gray at pH 8.4. At pH 8.8 the color is a faded blue, changing abruptly to a fine violet at pH 9.0. To illustrate the second type of mixture, Cohen's bromocresolpurple-bromothymolblue indicator (*E. S. R.*, 48, p. 109) is cited. This mixture is said to give a greenish yellow at pH 6.0 and a pure blue at pH 6.8, the change being sharp.

It is considered that a knowledge of the extinction or transmission-coefficients at various wave lengths and pH values is of assistance in the selection of suitable combinations.

The work reported in the present contribution consisted in the systematic study of indicator mixtures of both types above described and the selection of 25 mixtures covering the pH range from 3.25 to 10.8 as follows:

Tests of indicator mixtures

Components (0.1 per cent solutions)	Proportion	pT (pH of sharp color change)	Acid color	Alkali color	Notes
<i>Parts</i>					
Alcoholic dimethyl yellow ¹	1	3.25	Blue-violet.	Green.....	At pH 3.4 still green, 3.2 blue-violet; excellent indicator.
Alcoholic methylene blue ¹	1				
Aqueous methylene orange ¹	1	4.1	Violet.....	do.....	Good indicator, especially in artificial light.
Aqueous indigo carmine ^{1,2}	1				
Alcoholic hexamethoxytriphenylcarbinol.	1	4.0	do.....	do.....	Blue-violet at pH 4.0.
Methyl green.....	1				
Aqueous methyl orange.....	1	4.3	do.....	do.....	
Aniline blue.....	1				
Alcoholic bromocresol blue.....	3	5.1	Wine red.	do.....	Very sharp color change; excellent.
Methyl red ³	1				
Alcoholic methyl red ^{1,3}	1	5.4	Red-violet.	do.....	pH 5.2 red-violet, 5.4 dirty blue, 5.6 dirty green.
Alcoholic methylene blue ³	1				
Aqueous bromocresol blue sodium salt.	1	5.6	Violet.....	Yellowish green.	pH 5.6 red-brown; very good.
Aqueous sodium alizarin sulfonate.	1				
Aqueous chlorophenol red sodium salt.	1	5.8	Green.....	Violet.....	pH 5.8 weak violet.
Aqueous aniline blue.....	1				
Aqueous bromocresol blue sodium salt.	1	6.1	Yellowish green.	Blue-violet.	pH 5.4 blue-green, 5.8 blue tinged with violet, 6.2 blue-violet.
Aqueous chlorophenol red sodium salt.	1				
Aqueous bromocresol purple sodium salt.	1	6.7	Yellow....	Violet-blue.	pH 6.2 yellow-violet, 6.6 violet, 6.8 blue-violet.
Aqueous bromothymol blue sodium salt.	1				
Aqueous bromothymol blue sodium salt.	2	6.9	Violet.....	Blue.....	
Aqueous azolithmin.....	1				
Alcoholic neutral red ¹	1	7.0	Violet-blue.	Green.....	pH 7.0 violet-blue; excellent.
Alcoholic methylene blue ¹	1				
Alcoholic neutral red.....	1	7.2	Rose.....	do.....	pH 7.4 dirty green, 7.2 weak rose, 7.0 distinct rose.
Alcoholic bromothymol blue.....	1				
Cyanine in 50 per cent alcohol ⁴	2	7.3	Yellow....	Violet.....	pH 7.2 orange, 7.4 fine violet; color weakens on standing.
Phenol red in 50 per cent alcohol ⁴	1				
Aqueous bromothymol blue sodium salt.	1	7.5	do.....	do.....	pH 7.2 dirty green, 7.4 weak violet, 7.6 strong violet; excellent.
Aqueous phenol red sodium salt.	1				
Aqueous cresol red sodium salt.	1	8.3	do.....	do.....	pH 8.2 rose, 8.4 distinct violet; excellent.
Aqueous thymol blue, sodium salt.	3				
Alcoholic α -naphtholphthalein.....	2	8.3	Weak rose	do.....	pH 8.2 weak violet, 8.4 strong violet.
Alcoholic cresol red.....	1				
Alcoholic α -naphtholphthalein.....	1	8.9	do.....	do.....	pH 8.6 weak green, 9.0 distinct violet.
Alcoholic phenolphthalein.....	3				
Alcoholic phenolphthalein.....	1	8.9	Green.....	do.....	pH 8.8 dull blue, 9.0 violet.
Alcoholic methyl green.....	3				

¹ Keep in a dark bottle. ² 0.25 per cent solution. ³ 0.2 per cent solution. ⁴ Decomposes on keeping.

Tests of indicator mixtures—Continued.

Components (0.1 per cent solutions)	Proportion	pT (pH of sharp color change)	Acid color	Alkali color	Notes
Thymol blue in 50 per cent alcohol.	1	9.0	Yellow....	Violet....	Yellow through green to violet; excellent.
Phenolphthalein.....	3				
Phenolphthalein in 50 per cent alcohol.	2	9.6	Weak rose	...do....	Through green to violet; excellent.
Naphtholphthalein in 50 per cent alcohol.	1				
Alcoholic phenolphthalein.....	1	9.9	Colorless..	...do....	pH 9.6 rose, 10.0 violet; sharp change.
Alcoholic thymolphthalein.....	1				
Alcoholic phenolphthalein.....	1	10.0	Blue.....	Red.....	pH 10.0 violet; excellent.
Alcoholic Nile blue ¹	2				
Alcoholic thymolphthalein.....	2	10.2	Yellow....	Violet....	Sharp.
Alcoholic alizarin yellow.....	1				
Aqueous Nile blue.....	2	10.8	Green.....	Red-brown.	
Aqueous alizarin yellow.....	1				

¹ 0.2 per cent solution.

The following illustrative recommendations with regard to the use of mixed indicators are made: (1) 0.1 N pyridine and hydrochloric acid. The correct end point (pT) is pH 3.3. Dimethyl yellow, methyl orange, or bromothymol blue reach their end points too early. The dimethylyellow-methyleneblue mixture changes from green to violet exactly at the correct end point. The titration with this indicator was found accurate to about 0.5 per cent. In the presence of ammonia, a preliminary titration is made with a mixed indicator of a pT equivalent to pH 7.4, and a second titration, carried to the pyridine end point as above, gives the total base. (2) The weak acid veronal gives too early an end point with phenolphthalein, but may be titrated to an accuracy of 1 per cent with the thymolphthalein-alizarin yellow mixture (pT=pH 10.20). (3) The cresolred-thymolblue mixture permits the titration of carbonate to bicarbonate with a sharp end point (pT=pH 8.3).

Phosphoric acid and phosphates may be titrated to any one of the chemically possible end points, it is stated, by means of suitably mixed indicators. Other examples are given.

A new vacuum resistance vessel for conductivity measurements and conductometric volumetric analysis [trans. title], I. REMESOW (*Biochem. Ztschr.*, 189 (1927), No. 1-3, pp. 33-38, figs. 3).—A compact and relatively simple device in which temperature changes are said to be greatly reduced by the use of a double-walled, intramurally silvered and evacuated vessel of the Dewar flask type, mounted in a cork jacket, is described and figured.

A completion of the series of buffer solutions in the alkaline range [trans. title], J. M. KOLTHOFF and J. J. VLEESCHOUWER (*Biochem. Ztschr.*, 189 (1927), No. 1-3, pp. 191-193).—A number of series of buffer solutions covering the range pH 0.0 to pH 10.0 are available, and above pH 12, carbonate-free sodium hydroxide solutions can be prepared on the basis of a relatively simple calculation; but there is not, the authors consider, any systematically worked-out series for the connecting range, pH 10.0 to pH 12.0. For the range pH 11.0 to pH 12.2 they propose mixtures of 25 cc. 0.1 M disodium hydrogen phosphate with 0.1 N sodium hydroxide, using of the latter 4.13, 6.00, 8.67, 12.25, 16.65, and 21.60 cc., respectively, for pH 11.0, 11.2, 11.4, 11.6, 11.8, and 12.0, with sufficient water in each case to make up 50 cc.

For the region pH 9.2 to 11.0, sodium carbonate-borax mixtures 0.05 M each, are proposed, as given in the following table:

Proposed buffer solutions for pH 11.0 to 9.2

Composition of the solution		pH	Composition of the solution		pH
Sodium carbonate	Borax		Sodium carbonate	Borax	
cc.	cc.		cc.	cc.	
97.30	2.70	11.0	75.4	24.6	10.0
94.75	5.25	10.8	68.7	33.3	9.8
91.60	8.60	10.6	55.5	44.5	9.6
86.90	13.10	10.4	35.7	64.3	9.4
82.15	17.85	10.2	0	100.0	9.2

A table of mixtures of 0.1 M potassium dihydrogen phosphate and 0.05 M borax covering the range pH 6.0 to pH 9.2 is also included. All pH measurements were made with a hydrogen electrode in series with a standard quinhydrone electrode, and all components of the solutions were purified with exceptional care.

A comparative study of the quinhydrone and hydrogen electrodes for determining the hydrogen-ion concentration of soils, E. F. SNYDER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 9, pp. 825-834, figs. 2).—In a brief review of the literature on the application of the quinhydrone electrode to soils, following its adaptation to this purpose by Billmann (E. S. R., 52, p. 204), the confirmatory results of Christensen and Jensen (E. S. R., 51, p. 805) with respect to soils ranging in pH value from 3.5 to 8.5, and the close agreement between the quinhydrone and hydrogen electrodes obtained by Bayer (E. S. R., 55, p. 505), together with the failure of Brioux and Pien (E. S. R., 55, p. 206) to confirm Christensen and Jensen's results, are noted. A short partial summary of the theory of the calculation of pH values from quinhydrone electrode potentials is presented, and a report is made of experiments with (1) a simple form of hand-shaken quinhydrone electrode vessel, bridged by saturated potassium chloride to a saturated calomel electrode; (2) the same vessel operated as a nonbubbling type of hydrogen electrode apparatus; and (3) colorimetric determinations. The original should be consulted for the design of the apparatus used.

The work included among the hydrogen electrode measurements, comparative determinations in which electrodes coated with palladium, with platinum, and iridium black were used. In the quinhydrone electrode determinations platinum and gold foil were compared. The soil-water ratio was 1:2.

From numerous measurements on soils varying in pH value approximately from 4.0 to 9.0, it is concluded that excellent agreement between measurements made with the hydrogen and with the quinhydrone electrodes may be expected up to about pH 8.0, and that up to pH 9.0 "the constancy of the quinhydrone electrode measurements may, with an occasional exception, be considered good," although from about pH 8.0 to pH 9.0 the quinhydrone electrode potentials were found to drift gradually. The hydrogen electrode measurements between pH 4.0 and pH 9.0 were found to be, in general, reproducible and constant, equilibrium being attained usually in from 5 to 10 minutes. Palladium black, platinum black, and iridium black as coatings for hydrogen electrodes gave closely agreeing results in the soil suspensions examined. Gold foil electrodes were found preferable to platinum electrodes, however, in working with quin-

hydron, the gold reaching equilibrium more rapidly and yielding better agreement with the hydrogen electrode results.

The colorimetric determination of potassium in aqueous soil extracts as an indicator of the fertilizer requirements of the soil [trans. title], A. NĚMEC (*Biochem. Ztschr.*, 189 (1927), No. 1-3, pp. 50-56, fig. 1).—The potassium content of suitably prepared soil extracts was determined by a method consisting essentially in precipitating potassium chloroplatinate, reducing the platinum content of the precipitate redissolved by means of hot water with a hydrochloric acid solution of stannous chloride, and comparing the resulting brown-colored suspension with a similarly prepared standard solution containing in 50 cc. the equivalent of 1 mg. of potassium (2.4961 mg. of platinum). The standards were found to keep, if protected from light and reducing substances, for several weeks. Determinations by this method of the water-soluble potassium content in 41 Czechoslovakian soils are tabulated in comparison with the potassium absorption by seedlings as determined by Neubauer's method (E. S. R., 53, p. 319); and the relation between figures obtained is further illustrated by a graph of the water-soluble potash in milligrams per kilogram of soil against the potash absorbed by seedlings in milligrams per 100 gm. of soil, the resulting points grouping themselves in such a manner as strongly to suggest an approximate linear relationship.

It is concluded that the chemical method, shorter and more convenient than the seedling method, might serve as an approximate criterion for the estimation of the potash requirements of soils. Though subject to certain of the limitations of the Neubauer procedure, the proposed method is considered to furnish a comparative measure of the available potash in soils and will at least permit a qualitative distinction between richness and comparative poverty of soils in available potash supply.

Methods of iodine determination in soil, salt, and water-concentrates (*Indian Jour. Med. Research*, 15 (1927), No. 1, pp. 211-233, figs. 2).—Experimental trials of a number of published methods and modifications of these are described and discussed in detail, and three methods devised by C. Newcomb, B. Viswanath, and R. V. Norris are presented by the respective authors as applicable to determination of the minute quantities of iodine usually found in soils and water concentrates, as well as to the estimation of iodine in salt and other food products. The first method is based upon that of Grützner (E. S. R., 32, p. 505), the second upon somewhat similar procedures, and the third is a modification of that of McClendon (E. S. R., 52, p. 712).

In general in methods 1 and 2 the sample is fused with potassium or sodium hydroxide at about 400° C.; the iodine is set free by oxidation with "nitrose" (nitrosyl sulfuric acid) or bromine, and is extracted with carbon tetrachloride or with carbon disulfide for colorimetric estimation or titration with standard thiosulfate. In method 3 the sample is burned in a silica tube, heated to 900° in a combustion furnace, and traversed by a current of oxygen, and the iodine is absorbed in an alkaline solution.

The development and verification of each of these three procedures is described in detail, and the data obtained by their means on a considerable number of Indian soils, water supplies, and salts are given in three appended tables, where the relation of these figures to the endemicity of goitre in the localities from which the samples were taken is brought out in parallel columns.

The influence of proteins on the solubility of calcium phosphate, J. ČSAPÓ (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 509-515, figs. 3).—Horse serum was used as the protein solution for the experiments here reported, the procedure consisting essentially in preparing mixtures of the serum with monocalcium

phosphate solution, securing a suitable range of pH values by means of additions of 0.1 N sodium hydroxide to these mixtures, centrifuging vigorously after the solutions had stood 16 hours in an ice chest, and determining and plotting the product of the millimols of calcium and of phosphorus still in solution against the pH values.

Both with 16 per cent and with 11 per cent serum solutions the value of the calcium-phosphorus product dropped to a sharply defined minimum at pH 6.7, beyond which point both curves rose again sharply to a minimum at about pH 7.3. To the minimum solubility point at pH 6.7, the supernatant liquid after centrifuging was entirely clear, but from the minimum solubility point on, a turbidity which could not be removed by centrifuging was observed. The solubility of the calcium phosphate in the 11 per cent serum was uniformly lower than in the 16 per cent serum. Further experiments showed the turbidity to decrease with an increase in the concentration of the serum in the mixture up to at least 28 per cent of serum, and, since the calcium-phosphorus product remained stationary, the decrease in turbidity was considered to indicate an increase in the quantity of the dissolved calcium phosphate with increase in the protein concentration. Decreasing the initial phosphate concentration while maintaining the calcium concentration constant was found to shift the pH value of minimal solubility upward, this effect having been demonstrated in mixtures containing 6, 8, and 32 per cent of the serum. An increase in the proportion of serum similarly affected the pH value of minimal solubility.

It is included that proteins exert an inhibitory effect on the precipitation of calcium phosphate, both by holding it in solution against other physical factors and by supporting it in suspension.

The composition of natural organic materials and their decomposition in the soil.—I, Methods of quantitative analysis of plant materials, S. A. WAKSMAN and F. G. TENNEY (*Soil Sci.*, 24 (1927), No. 4, pp. 275-283).—To secure anything like a complete picture of the complex biochemical processes occurring in soils to which such natural organic matter as plant stubble, green manures, or stable manures have been added, neither the determination of one or more final products nor, on the other hand, a complete detailed analysis of the plant materials commonly introduced into the soil, is considered to have much value. A proximate analysis system adapted to the purpose of interpreting biochemical processes in the soil was the principal objective of the work reported in the present contribution from the New Jersey Experiment Stations, the system described involving the determination of (1) an ether-soluble fraction, (2) a water-soluble fraction, (3) cellulose and hemicelluloses, (4) lignins, (5) proteins and their derivatives, and (6) ash. The value of each of these determinations for the purpose of the soil microbiological work which they are intended to subserve is discussed, and detailed working directions, for which the original must be consulted, are given.

Management of cane soils. J. O. CARRERO (*Porto Rico Sta. Rpt.* 1926, pp. 10-14).—Continuing work on nitrogen utilization in sugar cane soils (E. S. R., 57, p. 412), the assistant chemist reports numerous variations in methods for the preparation of cane juice for determinations of nitrogen, phosphoric acid, calcium, potassium, magnesium, etc. The evaporation of the juice with concentrated sulfuric and nitric acid or with nitric acid alone was found impracticable on account of the excessive quantities of the acids required to destroy the large quantities of sugar and other organic matter present in the 250-cc. samples of the juice. The procedure finally adopted consisted in the inoculation of 250-cc. juice samples with a pure culture of yeast, followed by a fermentation period of 2 or 3 weeks, after which the solution was evaporated to

dryness, made up to the original volume with distilled water, again inoculated, and fermented for a further 2 or 3 weeks. It was then found possible to destroy most of the small remaining content of organic matter with from 25 to 40 cc. of nitric acid by boiling for 0.5 hour, the residue being readily ashed after evaporation.

Determination of the phosphoric acid content of 8 samples prepared by this method, and by evaporation and burning with magnesium nitrate, gave very closely agreeing results, as indicated by the figures quoted. The procedure was further tested by applying it to a check solution made up to have the following composition: Pure sucrose 16 gm., phosphoric anhydride 85 mg., potassium oxide 150 mg., calcium oxide 14 mg., and magnesium oxide 18 mg. per 100 cc. of juice. Both the fermentation procedure and the magnesium nitrate process gave an ash in which phosphoric acid and potash were determined with very close agreement with the known content of the samples, 4 of which were ashed by each method.

A similarly thorough examination was made of methods for the determination of calcium and nitrogen in the juice. The following procedure for the nitrogen determination was finally adopted: Add 10 cc. of concentrated sulfuric acid to 25 cc. of the juice to preserve it. After the digestion add a further 25 to 35 cc. of concentrated sulfuric acid, together with 15 gm. of anhydrous sodium sulfate and 0.2 gm. of copper sulfate.

To secure an ash for the determination of phosphoric acid, potash, lime, and magnesia, 300-cc. samples of the juice were subjected to the process of double fermentation, followed by nitric acid oxidation and ashing as described above.

A modified method for the estimation of total creatinine in small amounts of tissues, W. C. ROSE, O. M. HELMER, and A. CHANUTIN (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 543-548).—Briefly reviewing recent opinion, the authors find extraction methods for the removal of creatinine and creatine from tissues subject to criticism on the ground of probable incompleteness and low results, while disintegration by means of acids and heating is regarded by some as leading to too high results and is defended by other investigators.

The present authors give acid disintegration as their own preference, and propose a method similar to that suggested by Baumann (*E. S. R.*, 33, p. 13), except in the employment, following the disintegration with sulfuric acid, of tungstic acid as a clarifying agent. The method may be stated as follows:

If sufficient material is available, it should be run through a meat chopper before sampling. Small organs are to be cut up with scissors. Drop portions of approximately 1 gm. into previously weighed 50-cc. glass-stoppered Erlenmeyer flasks. Keep the flasks tightly closed to prevent evaporation of moisture until after reweighing to determine the exact weight of the sample. Treat each sample with 20 cc. of 2 N sulfuric acid. Cover the flasks with tinfoil and heat for 45 minutes in an autoclave at 15 lbs. steam pressure. Transfer each solution after cooling to a 100-cc. volumetric flask with the aid of 40 to 50 cc. of water to which has been added 18 cc. of 2 N sodium hydroxide and 5 cc. of 10 per cent sodium tungstate. The mixture should be faintly acid to Congo red. Make up to volume with water and shake thoroughly, allowing the flask to stand for 5 minutes before filtering.

The remainder of the method is identical with the procedure of Folin and Wu (*E. S. R.*, 41, p. 13) for the determination of creatinine in blood.

The various bromine-iodine numbers of the fats and oils [trans. title], W. VAUBEL (*Ztschr. Angew. Chem.*, 40 (1927), No. 41, pp. 1143-1145).—It is stated that the author has shown it possible to determine, by varying the time of reaction of the bromine, three distinct bromine numbers "which then, calcu-

lated over into iodine numbers, yield the corresponding bromine-iodine numbers."

The primary bromine-iodine number is defined by the amount of the direct absorption of gradually added bromine, the mixture being continuously shaken throughout the reaction and the end point determined by the appearance of a yellow color, or in colored substances, by the starch potassium iodide paper test. For the determination of the secondary bromine-iodine number, an abundant excess of bromide-bromate solution is added and allowed to stand two hours, with frequent shaking. The mixture is then titrated back with bisulfite solution, frequently standardized against the bromide-bromate reagent with the addition of a crystal of potassium iodide. The tertiary value is obtained by allowing the reaction to continue for two days under similar conditions. For these tests the oil or fat is dissolved in benzol or any carbon tetrachloride, placed in a shaking bottle, and treated with dilute hydrochloric acid. It was established that benzol gives no appreciable reaction under these conditions.

A table of the primary, secondary, and tertiary bromine-iodine values of over 40 samples of vegetable and animal oils, fats, and waxes determined in accordance with the system indicated is included.

On characteristic color reactions of lactic acid, methylglyoxal and carbohydrates with carbazole and sulfuric acid [trans. title], Z. DISCHÉ (*Biochem. Ztschr.*, 189 (1927), No. 1-3, pp. 77-80).—Characteristic color reactions with carbazol and concentrated sulfuric acid are given by carbohydrates, aliphatic aldehydes, and, by virtue of the formation of aldehydes during the reaction, by α -hydroxy acids, under the following conditions:

One part of the solution to be tested is treated with either 2 or 4 parts of concentrated sulfuric acid, the mixture being kept cool; 0.1 cc. of a 0.5 per cent alcoholic solution of carbazol is added; and the mixture is heated in a boiling water bath for 10 minutes. Entirely different color reactions are often obtained according to whether 2 or 4 parts of sulfuric acid are employed, the α -hydroxy acids, for example, giving usually no color when but 1 or 2 parts of sulfuric acid are added to 1 part of the solution to be tested. The first form of the reaction, which usually fails with α -hydroxy acids when applied directly, can be obtained with these compounds by treating 1 part of the test solution with 4 parts of sulfuric acid, as in reaction 2, but omitting the carbazol solution, heating in a boiling water bath for a few minutes (4 minutes in the tabulated experiments here presented), cooling, diluting with water so that the ratio of sulfuric acid to the water solution is reduced to 2:1 as in reaction 1, adding the carbazol reagent, and heating 10 minutes in the water bath. This last procedure is designated reaction 3.

The colors given in reactions 1 and 2 by aliphatic aldehydes having from 1 to 8 carbon atoms, arabinose, hexoses, and glycuronic acid, and reactions 2 and 3 for 8 α -hydroxy acids are tabulated. Among the results cited are, for formaldehyde, R-1 blue, R-2 green; for hexoses, R-1 lilac, R-2 red; for glycollic acid R-2 blue, R-3 blue; for lactic acid brown and olive green; for malic acid brown and yellow green; for tartaric acid green and blue; and for gluconic acid R-2 red and R-3 lilac.

Micro colorimetric studies.—I, A molybdc acid, stannous chloride reagent. The micro estimation of phosphate and calcium in pus, plasma, and spinal fluid, T. KUTTNER and H. R. COHEN (*Jour. Biol. Chem.*, 75 (1927), No. 2, pp. 517-531, figs. 3).—From a study of many reducing agents which may be used for the development of the color in the reaction of phosphates, pentavalent arsenic, or pentavalent antimony, with molybdc acid to produce a blue color, stannous chloride was found to be "by far the best when the concentrations of the reagents used are properly regulated."

The optimum concentration of sulfuric acid in which to conduct the reduction of the phosphomolybdic acid was found to be between 0.9 and 1.05 N in the final mixture, molybdic acid being itself reduced in sulfuric acid solutions of a concentration below the optimum range stated, while an increase of the sulfuric acid concentration above the upper limit of this optimum range caused retardation or inhibition of color production. The optimum concentration of sodium molybdate in the final mixture was shown to lie between 0.73 and 0.75 per cent, lower concentrations decreasing the color, while increasing the quantity of the molybdate above the optimum range brought about the reduction of the molybdic acid itself in direct proportion to the excess used. The optimal concentration of the stannous chloride, as determined in the experiments here described, lay between 0.02 and 0.022 per cent in the final mixture. An interfering action of nitric acid, nitrites, and hypochlorites at surprisingly minute concentrations was demonstrated, 0.00008 per cent of hypochlorite effecting a 20 per cent loss of color, for example; and a number of other substances were found to interfere in varying degree. It is, nevertheless, considered that with pure reagents about 0.001 mg. of phosphorus, arsenic, or antimony in the pentavalent condition may be detected by means of this reaction.

Detailed directions are given for the preparation of reagents and for the analytical procedure of methods (1) for the determination of from 0.01 to 0.03 mg. of phosphorus in 2.5 cc. of sample solution, and (2) for the similar determination of calcium precipitated as the phosphate.

Injury of vegetation caused by factory fumes—methods of chemical analysis [trans. title], G. VERPLANCKE (*Ann. Gembloux*, 33 (1927), No. 10, pp. 333-362).—The symptoms of toxication by industrial fumes and the relative sensitiveness of various plants are discussed at some length; and analytical methods, based upon familiar procedures, are given for the determination of sulfur dioxide in air and of various substances likely to be present in plants as the result of exposure to toxic industrial fumes.

Preventing spoilage in catsup (*New York State Sta. Bul.* 538 (1927), pop. ed., pp. 7, fig. 1).—Recipes and practical recommendations based upon the technical information recorded in the edition previously noted (*E. S. R.*, 56, p. 711) are given.

METEOROLOGY

Proceedings of the commission of agricultural meteorology, 1926 (*Organisation Météorologique Internationale. Commission de Météorologie Agricole. Procès Verbaux de la 2. Réunion, Zürich, 1926. Stockholm: Statens Met. Hydrog. Anst. (Pub. 256), 1927, pp. 87*).—An account is given of the meetings of the commission at Zürich in September, 1926, which includes reports on the present status of agricultural meteorology in different countries and proposals as to the improvement and extension of an international service. The commission voted to request the International Institute of Agriculture at Rome to seek to secure increased cooperation of the various countries of the world in studies in agricultural meteorology.

Symposium on some factors of climatic control (*Bul. Natl. Research Council*, No. 61 (1927), pp. 18-43, fig. 1).—This symposium, held at the eighth annual meeting of the American Geophysical Union in April, 1927, includes, besides introductory remarks by W. J. Humphreys (p. 18), papers on *The Influence of the Atmospheric Constituents upon Climate*, by L. B. Aldrich (pp. 19-24); *The General Circulation of the Atmosphere as a Climatic Control*, by A. J. Henry (pp. 24-28); *The Ocean Among the Factors of the Control of Climate*, by G. W. Littlehales (pp. 28-31); *The Critical Extent of Polar Ice*

Caps, by L. H. Adams (pp. 31, 32); Changes in Elevation of the Rocky Mountains in Pleistocene Time as Possible Climatic Factors, by J. T. Pardee (pp. 33-35); Some Post-Tertiary Changes in Alaska of Climatic Significance, by P. S. Smith (pp. 35-39); and Pleistocene and Recent Topographic Changes in the Pacific Coast States, by J. P. Buwalda (pp. 39-43).

A graphic representation of the weather in connection with the growth of grain crops [trans. title], N. N. TROITSKIĖ (TROITZKY) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 5 (1927), No. 4, pp. 283-287, figs. 2).—This article deals with the use of climographs in ecological studies applying the method worked out by R. Regel,¹ who has established the following groupings of frost-free days with reference to optima for certain physiological processes in plants:

(1) Cold days without frost, the average daily temperature fluctuating from 0.1 to 4.5° C. (32.2 to 40.1° F.), in which seeds become active. (2) Cool days without frost, the average daily temperature fluctuating from 4.6 to 9.9°, which induce development of subterranean vegetation, root formation. (3) Mild days with an average daily temperature varying from 10 to 14.9°, which favor normal growth of tops. (4) Warm days with an average daily temperature between 15 and 22°, in which the flowering parts of the plant are developed and fruit is formed. In temperate climates such temperatures retard somewhat the vegetative growth, but at times, when an excess of moisture is present, the vegetative portion may continue to grow to the detriment of fruit formation. (5) Hot days with average temperature higher than 22°, favoring the maturing of fruit.

Following these groupings the author shows graphically the weather conditions, such as temperature, sunlight, and rainfall, favorable for the growth of barley.

Rainfall and farming in the Transvaal (*Transvaal Univ. Col., Pretoria, Bul. 12* (1927), pp. 63, pls. 17, figs. 6).—This includes (1) A Preliminary Investigation into the Variability of the Rainfall of the Transvaal, by F. E. Plummer (pp. 3-46), and (2) Rainfall in Relation to Agriculture in the Transvaal, by H. D. Leppan (pp. 47-63).

Study of rainfall data for 299 stations having an average period of records of 18.6 years indicated that the rainfall of the Transvaal has a low efficiency, due chiefly to its unreliability and high intensity, the high rate of evaporation and of transpiration by plants, the marked seasonal distribution of the rainfall, and the frequent poor distribution within the growing season.

"The concentration of the greater proportion of the general mean annual rainfall into the brief period coinciding with the hottest months of the year imposes definite limitations to pasturage, to the planning of rotations, to cultural operations, to the maintenance of permanent fertility, and to intensive farming. The efficacy of the rainfall is lessened by the high coefficient of evaporation, due to intense insolation and winds. The loss of rainfall due to run-off is appreciable, and is accentuated by the intensity of the precipitation, by the diversity of relief, in some parts by the character of the soil and the diminishing vegetal cover. The rôle of irrigation in supplementing the rainfall, when compared with more favored countries, can only be a small one. The part of the rainfall lost to crops by percolation is small. The transpiration ratio of crops is high. An increased efficiency in the use of the rainfall would accrue by a judicious choice of crop plants and possibly by the rectification of soil deficiencies in plant food."

¹ *Trudy Būro Prikl. Bot. (Bul. Bur. Angew. Bot.)*, 2 (1909), No. 1, pp. 80; Ger. trans., pp. 58-80.

Forecasting a wool clip, H. BARKLEY (*Pastoral Rev.*, 37 (1927), No. 8, pp. 759-761, figs. 2; *abs. in Nature* [London], 120 (1927), No. 3026, p. 632).—In a previous study of the relation of the climatic factor to economic conditions in Australia (*E. S. R.*, 58, p. 14), the author showed the large dependence of the wheat harvest upon the rainfall of the preceding August and September. In this article he deals with the relation between rainfall and wool clip.

A study of a record for 34 years, 1893-1926, for a station near the center of the Western District of Australia showed a very close and direct relation between rainfall in January and February and the wool yield in November. The weight of the wool clip showed a progressive increase as the rainfall of these months rose from 1 to 4.5 in., the latter being the optimum value. Heavier rainfall caused a slight falling off in the wool yield. It was suggested that the increase in weight of the fleece might have been due in part to increase of greasy matter. The results are not considered conclusive because of the limited amount of data available for study.

SOILS—FERTILIZERS

Measurement of physical characteristics of soils, L. H. STAUFFER (*Soil Sci.*, 24 (1927), No. 5, pp. 373-379, figs. 4).—In the preparation of test cylinders for the determination of modulus of rupture, a procedure for the simultaneous measurement of shrinkage was devised at the Utah Experiment Station. Two small transverse scratches are marked upon the wet soil column as it is forced out of the tube in which it is formed, the marks being placed about 2.5 cm. apart on the soil cylinder. The distance between these marks is accurately measured with a cathetometer while the wet specimen stands in a vertical position on a glass plate. After drying the distance is again measured with the cathetometer, and the diameter is measured with micrometer calipers. The diameter of the wet cylinder is determined from that of the tube through which it is forced. The shrinkage per unit of volume is calculated from the formula

$$C = \frac{v_1 - v_2}{v_1}$$

in which v_1 is the volume wet and v_2 is the volume dry.

"This becomes

$$C = 1 - \frac{l_2 r_2^2}{l_1 r_1^2}$$

where l_1 , r_1 , and l_2 and r_2 are lengths and radii, wet and dry, respectively. Values of C accurate in the third figure are easily obtainable by this method. The determination is not only accurate, but variations in shrinkage in cylinders taken from the same soil sample are found only in the third figure. When the mean of a number of measurements is taken, the third figure becomes reliable. . . .

"Since the wet soil must be forced through a tube in making determinations of cohesion, modulus of rupture, and shrinkage, it is possible when the water content is not too high to make all three determinations at once on the same soil sample. The test specimens for modulus of rupture determinations may be marked and the shrinkage measured before they are used. This is very desirable, since it makes possible a study of relationships between these important physical characteristics."

The determination of soil colloids, A. F. JOSEPH (*Soil Sci.*, 24 (1927), No. 4, pp. 271-274).—This is a theoretical discussion of the soil colloid determination, presenting, as an objection to all the current methods, the fact that the properties of the soil colloids upon which the methods are based are a common pos-

session of the colloidal, and of other somewhat less finely divided, soil fractions, such as silt, etc. Tabulated data illustrative of the author's viewpoint show the colloid content of a number of soils as determined by the replaceable base, the water absorption, and the heat-of-wetting methods to give mean percentages in general equal to, or greater than, those of the clay fraction as determined by mechanical analysis. Fine silica, silt, and "permutite" are mentioned as examples of substances possessing the properties upon which existing methods of soil colloid determination depend, but not properly to be termed colloids. "At present," the author concludes, "the inorganic soil colloid content may be taken as synonymous with the clay content."

Electrodialysis of soils and the Mattson cell, N. A. CLARK, H. HUMFELD, and A. O. ALBEN (*Soil Sci.*, 24 (1927), No. 4, pp. 291-295, fig. 1).—The construction of a three-compartment cell for the electrodialysis of soils, similar to the previous design of Mattson (*E. S. R.*, 56, p. 115), is described and figured, with some notes on the cost of the apparatus. The expense is considered not excessive, except with respect to the cost of the platinum electrodes. It is suggested that a trident-shaped electrode of No. 22 platinum wire be substituted for the platinum gauze anode of Mattson's apparatus, with a copper gauze cathode. By the use of a copper cathode somewhat larger than the platinum cathode of Mattson's apparatus, to offset the lessened area of the platinum anode, faster dialysis was obtained than with the two platinum electrodes of the original design. Running cold water through grids of glass tubing in the compartments of the cell was found desirable for temperature control; and changing the dialysate at the end of 3, 10, 24, and 48 hours permitted the practical completion of the process. It was found possible to provide current for the apparatus from an alternating current supply by running a direct-current motor as a generator by means of an alternating-current motor of the same rated horsepower.

Some points about soil fertility illustrated from Craibstone experiments, J. HENDRICK (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 58 (1926), pp. 195-215).—This is a somewhat general discussion of natural and of artificially induced soil fertility and of the significance of fertility experiments based upon, and illustrated by, data from the fertility plat experiments at Craibstone, the experiment farm of the North of Scotland College of Agriculture. The Craibstone soil, mainly composed of glacially-ground granitic materials and chemically weathered only since the last glacial epoch, is typical of much of the surrounding territory, soils of somewhat similar type being found over considerable areas of the north and northeast of Scotland. Large reserves of lime, potash, soda, and magnesia in the form of insoluble compound silicates have a considerable effect on the general properties and fertility of these soils.

The experiments are considered to illustrate a point often previously demonstrated, namely, the unreliability of single-plot and single-season fertility, and soil-management tests. Results of triplicate plat experiments showed no very high degree of reliability, and "results of any high degree of probability could only be obtained by taking the general sense of the experiments over a considerable number of years and for a considerable number of plats."

Soil acidity experiments indicated a pH value of 6 as favorable for such crops as oats, turnips, and mixed hay. Reducing the soil acidity to pH 6.4 decreased the yields of these crops. The only crop tried for which the reduction of acidity below pH 6.0 was beneficial was barley, with respect to which "the evidence, so far as it goes, indicates that a pH value of 6.4 is rather more favorable to the barley crop than a pH value of 6." It is not considered that liming is without value for the soils examined, however; it was found useful

in the control of finger-and-toe of turnips and for checking the growth of some common weeds. For sugar beets and alfalfa it is stated that liming must be carried to, or nearly to, neutrality.

In general, stable manure gave better results on the Craibstone soils than did any combination of artificial fertilizers, though for the cereal crops artificial fertilizers were as effective or nearly so. The good natural supply of phosphates, potash, and other mineral nutrients is considered to account for the failure of phosphatic and potassic fertilizers to show marked effects. The principal needs of these soils are considered to be nitrogen and humus, which are supplied by the stable manure. Nitrogenous fertilizers, though the most expensive, produced the most remunerative results.

Wild legumes and soil fertility, E. CAMPBELL (*Ecology*, 8 (1927), No. 4, pp. 480-483).—This is a preliminary quantitative study of the natural revegetation of the Cotton Belt lands abandoned because of exhaustion. Qualitative observation having indicated that the percentage of wild legumes among the plants appearing naturally on such abandoned fields of very low fertility is at first large, decreasing gradually with increasing length of time in wild growth, quantitative measurements of the extent of this condition at various stages of the reestablishment of fertility and the relation of the observed facts with the chemical condition of the soil were made in series of quadrats, 3 yds. square, laid out at the following stations: West Lafayette, Ind.; Kenesaw Mountain, Marietta, Ga.; Fairburn, Ga.; Greenville, S. C.; Troy, N. C.; and Fredericksburg, Va. Total nitrogen was determined by the Kjeldahl method, nitrate nitrogen by colorimetric estimation with phenol disulfonic acid, and the relative acidity and lime requirement by means of the potassium thiocyanate test. At the same time the total percentage of legumes on the basis of the total number of all species of plants found and the identity of the leguminous species were recorded.

It was found that "the percentage of wild legumes in the native vegetation of impoverished soils is comparatively high. In natural revegetation the percentage of legumes decreases proportionately with the increase of total nitrogen in the soil. *Melilotus alba* (sweet clover) is the leading revegetation legume in the Middle Western States, while *Lespedeza striata* and other species of *Lespedeza* lead in the Southern States. The genus *Lespedeza* seems to be acid tolerant. The kinds and percentage of native legumes in any wild association of plants is an index of ecological conditions."

A comparative study of the bacterial flora of wind-blown soil.—III, Lake Michigan sand dunes, Indiana, L. M. SNOW (*Soil Sci.*, 24 (1927), No. 5, pp. 335-343, figs. 2).—The first (E. S. R., 55, p. 621) and second (E. S. R., 58, p. 18) papers of this series, dealing with the bacteria of the arroyo bank soil and with those of the Atlantic coast dunes at Sandwich, Mass., have been noted as indicated. The methods used in the present study were essentially the same as those of the previous work with the exception that the chlorination of the Chicago tap water necessitated its replacement in a nutrose agar culture medium by distilled water supplemented with suitable salts, according to the procedure of Waksman and Fred (E. S. R., 48, p. 212).

The Lake Michigan sand dunes are considered intermediate between the Arizona and Massachusetts soils examined with respect both to rainfall and to the physical and chemical characteristics of the soil. Certain difficulties in plating were encountered, so that the total number found are regarded by the author as not reliable and much below those which might be expected for such soil. The large percentages of fluorescent forms found in both dune sands are tentatively attributed to the proximity of large bodies of water. Short rods

predominate in the dune sands, whereas sporophorous rods were the most numerous forms found in the arroyo soil. Striking similarity among the three soils was noted with respect to (1) a predominance of Gram-negative forms, (2) a total absence of gas-producing organisms, (3) the almost total absence of forms capable of fermenting lactose, and (4) a notable proportion of white and yellow forms and the total absence of purple, blue, and black forms. The text includes a tentative classification of the groups of organisms found and a brief discussion of their distribution in the three soils thus far studied.

Effect of tree products on bacteriological activities in soil.—II, Study of forest soils. W. M. GIBBS and H. W. BATCHELOR (*Soil Sci.*, 24 (1927), No. 5, pp. 351-363).—This is an extension of previous work (E. S. R., 47, p. 812), in which the Idaho Experiment Station found certain tree products to inhibit ammonification and nitrate accumulation. The present investigation included the collection of 106 samples from widely separate points in the forest area of Idaho, with studies of groups of these samples to ascertain the distribution of *Azotobacter*, capacity to support *A. chroococcum* inoculated into them, their capacity to fix nitrogen when inoculated with *Azotobacter*, their ammonifying and nitrate accumulating power, etc. The effects of such tree products as leaves, needles, cones, bark, and the sawdust of trees common to the area under consideration upon nitrogen fixation in a culture solution and in soil were also investigated, the considerable volume of data obtained being summarized in the tables accompanying the article.

It was found in part that *Azotobacter* was present in 24.5 per cent of the samples surviving in 47 out of 60 inoculated samples for a period of somewhat over 18 months, beyond which time no further tests were made, but no direct correlation between either crop history or H-ion concentration and the presence of *Azotobacter* could be demonstrated. Of 24 samples tested for nitrogen fixation after inoculation and the addition of mannite as a source of energy, 5 showed a definite nitrogen-fixing ability. Sawdusts, with the exception of that of cedar, had little inhibiting effect on nitrogen fixation in culture solutions, but leaves and needles had some retarding influence. In soil none of these substances effected marked retardation of nitrogen fixation, and applications of 1 or 2 per cent of sawdust had a stimulating effect. Of 31 samples tested for ammonification and nitrate accumulation, all accumulated ammonia, but none showed normal ability to nitrify ammonium sulfate or dried blood, 16 of the 31 soils failing to show improvement as a result of the addition of calcium carbonate, while 15 were greatly benefited by this treatment. Inability to form nitrate was found largely in soils under virgin timber, while those possessing nitrifying ability were mostly soils which had been long under cultivation.

The composition of natural organic materials and their decomposition in the soil.—II, Influence of age of plant upon the rapidity and nature of its decomposition—rye plants. S. A. WAKSMAN and F. G. TENNEY (*Soil Sci.*, 24 (1927), No. 5, pp. 317-333, figs. 4).—Continuing the work begun with the elaboration of analytical methods in the paper noted on page 508, the authors present a further discussion of the information available with respect to the composition of natural sources of soil organic matter and of their decomposition in the soil. They conclude that a clearer understanding is to be desired with regard especially to (1) the rôle of the numerous soil organisms in the decomposition processes, (2) the part played by the nitrogen of the natural and soil organic matter in the various transformations, and (3) the relation between "humus" and microorganismic activity.

The experimental work reported consisted in a study of the composition of rye plants at various stages of their growth and of the decomposition of portions of these materials equivalent to 2 gm. of dry matter when incorporated

into 100-gm. portions of either sand or soil. Carbon dioxide and available nitrogen were determined at various intervals during the decomposition, while the composition of the organic matter as originally added and a partial analysis of that present at the end of the experiment in each case were also determined, with the use of the methods detailed in the first paper. The first sampling consisted of plants only from 10 to 14 in. high. The second was taken when heading had just begun, the heads remaining invisible in most of the plants. The third sampling, taken just before blooming, was divided into two portions, consisting of (1) the heads only and (2) the stems and leaves, the two parts of this cutting being treated separately. The fourth sampling, taken when the heads were fully formed and the grains well filled and in milk, and just beginning to harden, included (1) heads, (2) stems and leaves, and (3) roots. Tabulated analytical data are given, together with curves showing the rate of decomposition as indicated by the carbon dioxide evolution of the rye plants at the four stages of growth when incorporated into sand and into soil.

The more mature plants were found to decompose more slowly than the younger, the rapidity of decomposition depending upon the quantity of water-soluble constituents, the nitrogen content, lignin content, etc. The rapidity of liberation of available nitrogen was found to depend not only upon the nitrogen content of the plant, but also upon the rapidity of decomposition of its constituents, the younger plants containing more nitrogen and decomposing more rapidly. A nitrogen content of about 1.7 per cent was just sufficient to cover the requirements for its active decomposition within a period of 4 weeks. With the plant nitrogen content in excess of 1.7 per cent, the excess nitrogen was rapidly liberated in an available form even within the first 4 weeks of decomposition, while with less than 1.7 per cent, additional nitrogen was found necessary to the complete decomposition of the material. It is stated that, since there is a very definite ratio between the energy and nitrogen consumption of the microorganisms decomposing the organic matter, it is easy to calculate, with any given amount of plant material containing a known quantity of nitrogen, whether available nitrogen will be liberated or additional nitrogen required within a given period of time. It is also considered possible to calculate the proportion of this nitrogen required for the decomposition of the plant material and the period which must elapse before the nitrogen will be again available. Other conclusions include the opinion that the accumulation of the lignins, more resistant than other plant constituents to decomposition, and the synthesis of microbial nitrogenous complexes account for the increase in soil humus resulting from the decomposition of natural organic materials, and that the microorganismic synthesis accounts for the nitrogen content of soil humus.

Decomposition studies of alfalfa and sweet clover roots and straw, T. L. MARTIN (*Soil Sci.*, 24 (1927), No. 5, pp. 309-316, figs. 5).—While alfalfa and sweet clover are generally regarded as among the most valuable green manures, their relative importance, the author considers, has not been investigated thoroughly enough to warrant very definite statements. Holtz and Singleton (*E. S. R.*, 54, p. 216), using nitrification as an index of the rate of decay, found the roots and crowns of sweet clover to be nitrified more rapidly when incorporated into soil than were alfalfa roots and crowns, but roots alone have received little attention. Hopkins' work (*E. S. R.*, 23, p. 17) is cited as indicating that sweet clover tops are richer in nitrogen than are those of alfalfa but that the reverse relation holds for the roots, the present author's inference being that the proportion of crowns or leaf accumulations mixed with roots might be of considerable importance in the estimation of the relative green manure value of the two crops.

The alfalfa and sweet clover experiments here reported were accordingly made with roots alone in the entire absence of leaf or crown material, and carbon dioxide evolution, humus formation, and mold development were included with nitrate accumulation as indices of the decomposition rate. Parallel experiments were made with straw to relate the present with other experiments on organic matter decomposition. For the carbon dioxide experiments 150-gm. portions of a clay loam soil of pH 8 were treated with 1 per cent additions of air-dried ground alfalfa roots, sweet clover roots, and straw, respectively, in 500-cc. Erlenmeyer flasks. The moisture content of the soil was brought to 25 per cent on the basis of the dry material, and the flasks were held at from 19 to 21° C. for 40 days with daily determinations of the evolved carbon dioxide, 3 flasks being run as checks. A second series of experiments covering 21 days were also made, the daily carbon dioxide production of each type of mixture in each of the 2 series being present as a plot of the milligrams of carbon dioxide against time in days. Nitrate accumulation was determined under similar methodic conditions in a soil of pH 7.5 made up to hold at a 25 per cent moisture content, nitrate determinations at 30, 60, and 90 days being shown in the graph; humus determinations were made on soils treated as in the nitrate experiments and sampled at the same time, Waksman's method (E. S. R., 56, p. 421) being used for the humus determination; and, for the mold development studies, soils treated as in the nitrate experiments were sampled weekly for 6 weeks, mold counts and identifications of the molds present being made in triplicate on each sample.

It was concluded, considering all 4 indices of the decomposition rate, that the 3 materials studied decompose in the soil in the order: Alfalfa roots, sweet clover roots, straw. The greatest differences were found to occur soon after mixture, and thereafter decreased. The character of the mold flora varied with the source of the added organic matter, *Mucor*, *Rhizopus*, and *Alternaria* predominating in the alfalfa-root treatment; *Aspergillus* and *Penicillium* in the sweet clover root experiments; and *Cladosporium* in the straw-treated soil.

Green manuring ([*Rothamsted Expt. Sta., Harpenden*], *Rothamsted Conferences*, No. 3 (1927), pp. 39).—This is a report, in booklet form, of the third Rothamsted conference, and contains the papers listed below together with a discussion of these and a summary treatment of present green manuring practice, especially as applying to English conditions: *Green Manuring on Chalk in S. W. Sussex*, by H. Drewitt (pp. 5, 6); *Experience with Green Manuring on Light Lands in Norfolk*, by U. Upcher (pp. 7-10); *Green Manuring on a Bedfordshire Farm*, by H. Inskip (pp. 10-13); *Some Recent Experiments on Green Manuring*, by H. J. Page (pp. 13-21); *Green Manuring*, by J. A. Voelcker (pp. 21-24); *Organic Manuring in the Lothians*, by W. Bruce (pp. 24-27); *Green Manuring in Surrey*, by J. H. Mattinson (pp. 28-30); and *The Cultivation of Lupins*, by A. W. Oldershaw (pp. 31-33).

A résumé of the problem of nitrogen losses through denitrification, A. M. BUSWELL and S. L. NEAVE (*Soil Sci.*, 24 (1927), No. 4, pp. 285-290).—This is a brief critical review of the literature on bacterial denitrification, presenting the view that a survey of the published work on gaseous nitrogen loss "shows at least the need for great caution in interpreting some of the best experimental reports and for more adequate verification of many current hypotheses." It is indicated that losses of nitrogen as the free element are considerably less than has been generally supposed. The paper is accompanied by a bibliography of 50 titles.

A biological measurement of available soil potassium, D. E. HALEY and F. J. HOLDEN (*Soil Sci.*, 24 (1927), No. 5, pp. 345-350).—A form of the Neubauer

method (E. S. R., 53, p. 319), attributed to Neubauer and Schneider and noted as having been described in detail by Ames and Gerdel (E. S. R., 58, p. 16), was used, with some modification, in these experiments of the Pennsylvania Experiment Station to measure the availability of the potassium content of two soils having a known history with respect to fertilizer treatment and to determine the quantity of potassium absorbed by buckwheat plants grown in direct contact with the soils. Buckwheat was chosen as a test plant in these experiments both by reason of its relatively large potassium absorption and because of its adaptability to greenhouse conditions.

Jars containing 2,750 gm. of sand, alone or with various proportions of soil, were started with 15 selected seeds, and thinned after germination to either 6 or 7 plants per jar. A complete nutrient solution (diammonium phosphate, calcium monophosphate, calcium nitrate, magnesium sulfate, potassium sulfate, and ferric chloride) was added to the jars receiving no potassium in the form of soil, the potassium sulfate being omitted from the nutrient solution in the treatment of the soil pots. The two soils used were taken from plats cultivated and cropped continuously since 1881, one having had no fertilizer during this period, while the other had received a total of 18 biennial additions of 200 lbs. per acre of potassium chloride. Portions of 12.5, 25.0, 37.5 and 50.0 gm. of each of these soils were mixed with a dried sand in the jars, after which the mixtures were wetted to a moisture content of approximately 14 per cent and held at about that figure throughout the experiment. Full data with respect to the treatments, weights of potassium absorbed, yields of dry matter, etc., for the 46 pots set up in the experiment are given, together with Frear and Erb's (E. S. R., 40, p. 25) data on the percentages of the various forms of potassium found in the soils tested.

The average percentages of potassium available for plant growth as calculated from the average quantities of potassium absorbed by the plants in excess of the absorption in the check pots were found to be 0.0252 in the treated and 0.0115 in the untreated soils. These figures were practically the same as those obtained by Frear and Erb, above cited, in determinations of the potassium soluble in 0.2 N hydrochloric acid, the chemical method having shown 0.0250 and 0.0118 per cent of available potassium in the treated and in the untreated soils, respectively.

It is considered that, although the results are not sufficient to warrant definite conclusions, there seems, nevertheless, to be a close correlation between the quantities of potassium absorbed by buckwheat plants above the roots and the quantities extracted by the 0.2 N hydrochloric acid. This preliminary work is considered to suggest, therefore, a method of attack upon the determination of the availability of potassium in soils.

Some reactions between mono-calcium phosphate and soils, R. H. AUSTIN (*Soil Sci.*, 24 (1927), No. 4, pp. 263-269).—Hothouse or field-plat work on the insolubilization of phosphates, interpreted in terms of crop response "is valuable but does not determine the several factors and their influence upon the solubility of the phosphorus of the soil," in the author's belief. The fundamental facts can be reached only by the isolation and separate study of the several soil components involved.

The experiments reported in this contribution from the Michigan State College are, accordingly, concerned with the pH changes and chemical reactions occurring in the separate titration of calcium hydroxide, magnesium hydroxide, calcium carbonate, and the hydrated oxides of aluminum and of ferric iron. In the case of the titrations of calcium monophosphate and diphosphate against calcium hydroxide, data on the pH value of the mixtures, the nature of

the precipitate (di- or tri-calcium phosphate), if any, and the percentage of the added phosphate remaining in solution for various calcium hydroxide: calcium monophosphate ratios and with monophosphate concentrations equivalent to 100, 200, and 300 lbs. per acre are given. For the series of diphosphate and calcium hydroxide, and of monophosphate and either ferric hydroxide or aluminum hydroxide, similar data except with respect to the precipitates are tabulated.

In the titration of calcium monophosphate with calcium hydroxide both the diphosphate and the triphosphate were formed, but with calcium carbonate only the diphosphate was found. Ferric hydroxide was shown to be much more active in the insolubilization of phosphates than aluminum hydroxide; and the data of these experiments did not substantiate the general belief that aluminum renders phosphates highly insoluble in acid soils. In fact, despite the high degree of insolubility of aluminum phosphate, 82 per cent of the added phosphorus remained soluble during the 14 days of the experiment with calcium monophosphate and aluminum hydroxide. It was determined that the formation of dicalcium phosphate takes place at pH 5.6 or slightly above. In general, the phosphate solubility decreased rapidly with a change from an acid, toward an alkaline reaction. It is considered that the results of these experiments as a whole indicate that the frequent occurrence of extremely low solubility of phosphates in the soil can be attributed neither to the soil reaction nor to the content of iron or aluminum, but must result, at least in part, from other factors at present unknown.

The effect of the hydrogen-ion concentration upon the absorption of calcium by a colloidal clay, R. BRADFIELD and E. W. COWAN (*Soil Sci.*, 24 (1927), No. 5, pp. 365-372, figs. 4).—In previous work on the absorption of potassium (E. S. R., 51, p. 721) and of calcium,^{*} closely concordant results were obtained in the acid region, but significant differences were observed in the alkaline region. The present communication from the Missouri Experiment Station includes (1) a résumé of the findings on absorption of calcium at various H-ion concentrations, (2) some results obtained with colloidal clay by a potentiometric method, and (3) an explanation of the apparent discrepancy between the earlier and the more recent work.

Sufficient 0.042 N calcium hydroxide and 6.30 per cent clay sol were placed in each of 14 volumetric flasks to make the final mixture 0.03 N with respect to calcium and of a 1 per cent concentration with respect to the clay, sufficient hydrochloric acid (as determined from a titration curve of the clay with calcium hydroxide) to give each solution the desired pH value being added before making up to volume. After these mixtures had been allowed to stand for three days, aliquots of the clear supernatant liquid were examined for pH value and for their content of silica, alumina, calcium oxide, magnesia, and sodium and potassium oxides, resulting data being presented in tabular and graphic form. The question raised by these results with respect to the relative importance of the concentrations of the calcium and the hydroxyl ions in causing the increasing calcium absorption noted when the calcium hydroxide was increased was studied in similar series of experiments, in which 0.0084, 0.0168, 0.0252, and 0.0300 N concentrations of calcium hydroxide were used.

A plot of the data from these four series of experiments shows the effect of variation in calcium-ion concentration to have been negligible in comparison

^{*} The effect of the hydrogen-ion concentration upon the absorption of calcium by colloidal clay, E. W. Cowan, Thesis, Univ. Missouri, 1924.

with the effect of the hydroxyl-ion concentration. Titration curves of sodium and of barium hydroxides against electrodyalized clay sol are also presented.

It is concluded in part that in the absorption of calcium by colloidal clay from pH 2 to pH 12, the absorption curve was steepest in the most alkaline region, and that there was no evidence of saturation; that the quantity of calcium absorbed by colloidal clay seems to be independent of the calcium-ion concentration when the absorption at the different concentrations is larger at the same pH value; and that absorption curves for electrodyalized clay and sodium hydroxide or barium hydroxide consisted of two portions, convex to the pH axis in the acid range and concave to the pH axis in the alkaline range. The exchangeable hydrogen is considered to have been neutralized in the first portion of these curves, the decomposition of the exchange complex being supposed to have taken place in the second portion, with the formation of simpler silicates and aluminates.

The importance in the development of plants of the quantities of zinc and lead added to the soil from smoke gases [trans. title], H. LUNDEGÅRDH (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 326 (1927), pp. 14, figs. 2; Eng. abs., pp. 13, 14*).—Natural soils contain, in general, no measureable quantities of such heavy metals as act in solution as powerful plant poisons, an exception being noted, however, in the case of the so-called "calamine" soils,³ characterized by a peculiar vegetation. The present investigation deals with soil from a field situated close to a zinc-ore roasting plant at Rävåla, in the southern part of Dalarna Province, Sweden, this soil having been found to contain from 0.017 to 0.035 per cent of zinc in the surface soil and from 0.007 to 0.040 per cent of zinc in the subsoil, together with lead amounting in one instance to 0.018 per cent. No copper was found. The soil supported but poor growth.

Samples of 25 kg. of this soil were taken from 6 symmetrical points in the field, and greenhouse pot cultures of these samples were made, with the addition of (1) a normal complete fertilization treatment, and (2) one-half of this quantity of the mineral nutrients, the additions being made either in the form of nutrient solutions or by mixing the salts themselves with the soil. Germination experiments in a complete nutrient solution were also carried out with oats, wheat, and clover in the presence of small concentrations of zinc sulfate. In the pot cultures *Poa annua* and oats were used as test plants.

Excellent results were obtained from the addition of nutrients in the soil pot experiments, and in the culture solutions concentrations of from $n/300,000$ and $n/60,000$ of zinc sulfate were found in some cases weakly stimulant, in others weakly inhibitive. Oats germinated normally even in an $n/3,000$ solution of zinc sulfate. When the plants were grown for a longer time in the culture solution, however, a retarding effect of concentrations of either zinc or lead as low as $n/5,000,000$ could be observed, although more zinc could be added to the already zinc-contaminated soils from the field under examination without damage to the plants grown in them. It is concluded that the zinc and lead deposited in the soils studied from the fumes of the roasting plant are present only in forms so nearly insoluble that they are physiologically inert.

AGRICULTURAL BOTANY

Characters of cells attaining great age, D. T. MACDOUGAL and F. L. LONG (*Amer. Nat.*, 61 (1927), No. 676, pp. 385-406, figs. 4).—Cells of medulla and cortex of the massive cactus, *Ferocactus (Echinocactus) wislizeni*, have been

³ Pflanzen-Geographie auf Physiologischer Grundlage, A. F. W. Schimper. Jena: Gustav Fischer, 1898, p. 104.

found to live for a century or more, somewhat like the medullary cells of *Carnegiea*, previously noted (E. S. R., 56, p. 516). Medullary cells attain full size in the first decade, afterwards undergoing some deformation but no measurable change in volume during the following century. Cortical cells increase cross sectionally 40 times in the first decade, but the average cell cross-section area only doubles during the following century. Neither medulla nor cortex retains meristematic capacity as in case of *Carnegiea*. Growth details are indicated.

Relative dry weight increases with age in medullary cells but decreases in cortical cells. Carbohydrates decrease with age in both medulla and cortex. The osmotic value of the cell sap diminishes with age in both medulla and cortex. Permeability of cell masses of both cortex and medulla increases with age, coincidentally with wasting of the protoplast and accentuation of the perforations of walls. Increase in crystals and insoluble inclusions occurs in both medulla and cortex with age. The results here described are supported by previous tests indicating that the pentosan component of protoplasm is wasted during senescence, and that lipoids and proteins undergo lesser change with age. The respiration of plants being essentially of a carbohydrate character, the total titratable acidity of the cells shows a diminution with age.

The influence of high temperatures, compatible with life, on cell development [trans. title], M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 20, pp. 1460-1462).—Tabular showing, with discussion, is given of the development, specifically as regards dry matter, of *Sterigmatocystis nigra* at temperatures of 36, 38, 40, 42, and 44° C.

Observations on cell pigments [trans. title], J. AMAR (*Compt. Rend. Acad. Sci. [Paris]*, 183 (1926), No. 3, pp. 235-237).—Discussion of cellular pigment origin, evolution, and relations presupposes an activity in the medium which must be continuous, supposedly hereditary.

The vacuome of *Erysiphe graminis* [trans. title], S. BACHE-WIIG (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 4, pp. 309-311).—Interpretations are offered regarding the various forms of the vacuome of the conidiophore apparatus in *E. graminis*.

Instability of forms and permanence of mitochondria [trans. title], A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 3, pp. 221-223, fig. 1).—Mitochondrial changes of form occurring within 30 minutes in *Saprolegnia* and segmentation occurring in *Elodea canadensis* are shown. Transitory deformations are due in great part to cytoplasmic currents, but the general aspect of the chondriome was not altered during observation and the mitochondria preserved their individuality.

Establishment of heredity in acquired characters [trans. title], C. RICHET, E. BACHRACH, and H. CARDOT (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 26, pp. 1997, 1998).—Modification of the medium under the prolonged influence of a salt alters profoundly the biological characters of the cell. Under the prolonged action of potassium chlorate, two new characters appeared which became hereditarily stable.

[Acquired characters], P. LESAGE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 11, pp. 854, 855).—Among characters which have appeared or shown modification in *Lepidium sativum* cultures since 1911, seed plumpness and fruit anomalies exhibit clearly and increasingly their relation to the influence of saltiness in their water supply.

The heritability of the character precocity and its conservation in aged seeds [trans. title], P. LESAGE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 21, pp. 1604, 1605).—Studies with *Lepidium sativum* have shown that seeds ripened under glass give, in open air, plants which grow more rapidly than do

those grown from seeds ripened in open air. The performance of such plants in successive years is shown.

Recent heredity studies on grafted Jerusalem artichokes [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 19, pp. 1426-1428, figs. 7).—Since 1895 the author has studied the same variety of Jerusalem artichoke cultivated on its own roots or grafted on forms more or less related. In 1898 (E. S. R., 11, p. 343), he set forth the modifications produced by grafting, principally in the form, number, weight, and position of the tubers. Some of these modifications became hereditary and constitute an interesting improvement of the type. *Helianthus tuberosus mangini* has been culturally stable for some years.

In 1921 the author grafted this type on the annual sunflower, obtaining at the same time seeds and aerial tubers which have been studied as to heredity in the two sorts of organs. From the seeds have come various plants, among these *H. tuberosus dangeardi*, considered an irrefutable example of the inheritance of characters acquired by grafting. Others are of practical interest, and among these one, considered a good cultural variety, has been named *H. tuberosus dauciformis*. Discussion is given of different modifications.

Development and greening of plastids in cotyledons of legumes during germination [trans. title], A. MAIGE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 11, pp. 855-857).—The physiology and chemistry of changes observed in bean, pea, and broad bean during germination are briefly described.

Photosynthetic products [trans. title], P. MAZE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 4, pp. 306-309).—It is deduced from figures shown to result from a study of the products of photosynthesis that the ratio of photosynthetic assimilation is always greater than 1. The ratio of hydrogen to oxygen is always above 1:8.

The quantitative bioenergetic law of the formation of carbohydrates at the expense of proteins and fats in plants [trans. title], E. F. TERROINE, S. TRAUTMANN, and R. BONNET (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 15, pp. 1181-1183).—In plants, the transformation of proteins into carbohydrates is accompanied by a loss of 35 per cent of the metabolized energy, that of fats by a loss of 23 per cent.

Phosphoric acid and nitrogen in leaves of well nourished vines [trans. title], H. LAGATU and L. MAUME (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 15, pp. 1179-1181, fig. 1).—The authors' findings relative to phosphoric acid and nitrogen are given. In vines well nourished and productive, the development of physiological ratios of the fertilizing principles, as observed in the leaves, appears to obey certain simple laws. The optimum chemical process may serve for reference so as to be able to recognize, in case of defective nutrition and low yield, any insufficiency or excess of a fertilizing principle by its relation to others.

Movement of nitrogenous materials from leaf to stem during autumnal yellowing [trans. title], R. COMBES (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 26, pp. 2056-2058).—Studies with *Castanea vulgaris* and *Fagus sylvatica*, testing data previously reported (E. S. R., 53, p. 325), are briefly described, with tabulation of results. Nitrogen which disappears from the leaves is recoverable from the stem of a detached branch to such an extent that the total nitrogen in the branch does not vary sensibly. Points of accumulation are indicated, with comparisons.

Selective take-up of potassium by plants [trans. title], G. ANDRÉ and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 13, pp. 1052-1054).—Analysis of forage beets July 31 and October 31 is shown, with percent-

ages of potassium and of sodium at each period and the potassium to sodium ratio in exterior, interior, and median regions.

Hexamethylenetetramine as plant food [trans. title], E. and G. NICOLAS (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 11, pp. 860, 861).—Hexamethylenetetramine, in the amounts here tabulated, favored the production of dry material in bean and in mustard and is, therefore, regarded as a true plant food.

Glucosides of indigenous orchids [trans. title], P. DELAUNEY (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 3, pp. 224, 225).—The presence of loroglossoside (loroglossin) is regarded as probable in *Goodyera repens*, *Limodorum abortivum*, *Spiranthes autumnalis*, and *Orchis ustulata*.

Methods of estimating the level of the threshold of amylogenic condensation [trans. title], A. MAIGE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 19, pp. 1428-1431).—Four methods are shown.

Soluble ferments produced by Hymenomycetes: Reducing action [trans. title], L. LUTZ (*Compt. Rend. Acad. Sci. [Paris]*, 183 (1926), No. 3, pp. 246, 247).—Studies made on *Stereum hirsutum*, *S. purpureum*, *Corticium quercinum*, *Polyporus versicolor*, *P. pinicola*, *P. betulinus*, *P. ignarius*, *Trametes medullipans*, *Pleurotus ostreatus*, and *P. eryngii* gave sensible quality or intensity color changes in several colorants named. Some of these are briefly discussed.

Peroxidases in dry seeds [trans. title], H. COUPIN (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 9, pp. 685-687).—Peroxidases are readily demonstrated in various seed parts of plants named, extending over a wide systematic range.

The action of mineral and organic acids combined with that of metallic sodium on the reddening of some flavones [trans. title], ST. JONESCO (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 20, pp. 1523-1525).—It appears from these studies that nascent hydrogen does not reduce the flavones to a red pigment, that metallic sodium alone is the agent of modification of flavonic chromogens, that the reddening is due to the action of mineral acids (hydrochloric and sulfuric) on the flavone as modified by sodium, and that the red product so obtained is not an anthocyanin.

The form of tannins existing in Spirogyras [trans. title], E. M. DUBAND (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 6, pp. 460-462).—A confirmatory study is reported of the tannins of the Spirogyras, which are said to be entirely soluble in acetone.

The blackening of Orobanches during desiccation [trans. title], M. BRIDEL and C. CHARAUX (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 5, pp. 387, 388).—Blackening of Orobanches while drying is attributed to the presence of orobanchoside, a specific glucoside, the behavior of which is discussed.

Influence of oxygen content of water upon the respiration of submerged plants [trans. title], A. HÉE and R. BONNET (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 6, pp. 457-459).—Experimental data published pending the appearance of a full account show that the intensity of respiration in submerged plants is not greatly modified by variations in the oxygen content. The authors were not able to confirm certain data reported by Wurmser and Jacquot (*E. S. R.*, 54, p. 124).

Depth limits of vegetation in the Lake of Annecy [trans. title], P. DANGEARD (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 4, pp. 304-306).—Ranges and details are given.

GENETICS

[Contributions to plant genetics] (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 46 (1927), No. 1, pp. 19, 20, 22, 23-26, 30, 31, 35, 37, 40, 43-45, 46-50, 51-53, 54, 55, 56-60, 61-63, 83, 84).—Papers dealing with plant genetics presented at the

Fifth International Congress for Genetics held in Berlin, September 11-17, 1927, are given in summary form in these pages.

Section 1, General Genetics, included The Inheritance of Variegation in Some Ferns, by I. Andersson (pp. 19, 20); Factor Mutations in Antirrhinum [trans. title], by E. Baur (p. 20); Species Hybridization in Nicotiana [trans. title], by F. Brieger (p. 22); Mutations in the Fungi [trans. title], by F. Chodat (pp. 23, 24); Clones in the Lower Algae [trans. title], by R. Chodat (pp. 24, 25); Interspecific Hybridization and the Origin of Species in Nicotiana, by R. E. Clausen (p. 25); The Genetics of Heterostyly [trans. title], by A. Ernst (pp. 25, 26); Another Mendelian Species Hybrid: *Epiconaptera tremulifolia* × *E. ilicifolia* [trans. title], by F. Lenz (p. 30); Biometric-Geographic Investigation of Heterostyly in *Anchusa officinalis* [trans. title], by G. Lewitsky (p. 30); A Case of Nonmendelian Inheritance [trans. title], by F. A. Lillienfeld (p. 31); A New Gene Mutation (Mut. *bullata*) in *Oenothera lamarckiana* and Its Linkage Relations, by G. H. Shull (p. 35); Studies on the Partial Sterility of *Aquilegia* Hybrids [trans. title], by M. Skalinska (p. 35); Mutations in *Oenothera biennis* [trans. title], by T. J. Stomps (p. 37); and Mutation, Adaptation to Temperature Differences, and Geographical Distribution in Plants, by O. E. White (p. 40).

Section 2, Cytology and Genetics, included Chromosome Number in *Silene* and the Neighbouring Genera, by K. B. Blackburn (p. 43); The Relation of Cytological Findings to Certain Genetical Problems in *Oenothera*, with Special Reference to a Study of Certain F₁ Hybrids, by R. E. Cleland (pp. 43, 44); The Relations of Cytology to Genetics in *Oenothera*, by R. R. Gates (pp. 44, 45); Experimentally Produced Tetraploidy in Ferns [trans. title], by A. Heilbroun (p. 46); Differential Polyploidy in *Rosa*, by C. C. Hurst (pp. 46, 47); Genetical and Cytological Studies of the Origin of Fatuoid Oats and Speltoid Wheats, by C. L. Huskins (pp. 47, 48); Polyploid Hybrid: *Raphanus sativus* × *Brassica oleracea* [trans. title], by G. D. Karpetschenko (pp. 48, 49); Cytological Investigations in Seed and Stone Fruit Species [trans. title], by F. Kobel (p. 49); The Systematic Cytology of *Festuca* [trans. title], by G. Lewitsky (p. 50); "Amphiplasty," a New Cytological Phenomena [trans. title], by M. Nawaschin (pp. 51, 52); Hylogenetic Investigations in Wheat [trans. title], by A. A. and L. A. Sapëhin (p. 52); Chromosome Behavior in Wheat Hybrids, by K. Sax (pp. 52, 53); Cytological Behavior in Vicia [trans. title], by I. Sweschnikowa (pp. 54, 55); and Chromosome Combinations in *Ribes gordonianum* (*R. sanguineum* × *R. aureum*) [trans. title], by G. Tischler (p. 55).

Papers given in Section 3, Genetics of Crop Plants, included Rare Wheat Hybrids [trans. title], by [L.] Blaringhem (pp. 56, 57); Cytological Studies of Rare Cereal and Beet Hybrids [trans. title], by H. Bleier (p. 57); Probable Influence of Heterosis on the Productivity of Wheat [trans. title], by F. Boeuf and J. Lenoble (p. 57); Modification of the Anatomical Leaf Structure and Developmental Rhythm in Wheat Varieties [trans. title], by F. Christiansen-Weniger (p. 58); False Wild Oats: Mutations or Hybrids? [trans. title], by C. Crépin (pp. 58, 59); Results of a Nine Years' Inbreeding Experiment with Rye [trans. title], by J. Duckart (pp. 59, 60); Change in Dominance in the Response to Light in the Germination [of Tobacco Seed] [trans. title], by J. A. Honing (p. 61); Linkage of Size, Shape, and Color Genes in *Lycopersicum*, by E. W. Lindstrom (pp. 61, 62); A Peculiar Case of Heterosis in *Phaseolus vulgaris*, by E. Malinowski (p. 62); Further Data on the Genetics of Rogues in the Culinary Pea (*Pisum sativum*), by O. Pellew (p. 62); Demonstration of Some Hybrids of *Aegilops* Spec. × Wheats, by J. Percival (p. 63); The Inheritance of Quantitative Characters in Wheat [trans. title], by J. Philpitschenko

(pp. 63, 64); Abnormal Segregations Arising from Crosses Between the Potato and Allied Species (p. 64), and The Inheritance of Cropping in the Potato (pp. 64, 65), both by R. Salaman; A Method for Quantitative Estimation of the Developmental Rhythm in Cereals [trans. title], by A. Scheibe (p. 65); The Inheritance of the Length and Number of Stomata in *Zea mays* [trans. title], by A. Tavčar (pp. 65, 66); Rare Cereal and Beet Hybrids [trans. title], by E. von Tschermak-Seysenegg (pp. 66, 67); Further Linkage Work in *Pisum sativum* and *Primula sinensis*, by D. de Winton (p. 67); and A Contribution to the Classification of the Genus *Gossypium* L., by G. S. Zaitzev (p. 68).

A paper on Genetics of *Datura*, by A. F. Blakeslee (pp. 83, 84) is also included.

Quantitative methods in genetic research, H. J. MULLER (*Amer. Nat.*, 61 (1927), No. 676, pp. 407-419).—The author outlines the development of our present concepts in genetics as being the result of the application of quantitative methods, bringing forth as examples the working out of Mendel's laws, the correlation of sex determination with cytological studies, the explanation of linkage, the mapping of the chromosomes, gene stability, the multiple factor hypothesis, and the concept of heterosis.

New lines for advance are suggested in phaenogenetics, quantitative study of Mendelian inheritance under synthetic conditions by the aid of mathematics, and the physiology of gene mutations.

Quantitative methods of research and the problems of animal breeding, J. W. GOWEN (*Amer. Nat.*, 61 (1927), No. 676, pp. 420-429, figs. 5).—The service which mathematics has contributed to the more exact analysis of breeding problems in egg and milk production is discussed.

Supernumerary chromosomes in *Zea mays*, A. E. LONGLEY (*Jour. Agr. Research* [U. S.], 35 (1927), No. 9, pp. 769-784, figs. 5).—The character and behavior of extra chromosomes in corn are described from three years' study of chromosomes in microspore mother cells. Of the many corns examined, Golden Bantam, Stowell Evergreen, Country Gentleman, Black Mexican, White Sheath (a strain of Pawnee flour corn), and a highly inbred strain of Crosby White Dent were the only ones in which plants with a haploid number exceeding 10 were found.

The 10 (haploid) normal chromosomes present in most corn varieties and forms when viewed in the heterotypic division have individual characteristics such as size, shape, and position of fiber attachment. This chromosome set is composed of six double V's, two double J's, a figure 8, and a small chromosome with shape not easily described. The behavior of the normal chromosome set during the reduction phases is, with rare exceptions, regular.

Extra chromosomes resemble in size and shape the smallest of the normal chromosome set. The distribution of a supernumerary chromosome to the four daughter cells was found to be erratic. It goes undivided to one or the other of the poles in the first reduction division, and nondisjunction occurs in varying percentages in the second division. In microspore mother cells nondisjunction varied from 0 to 100 per cent in five progenies studied, while nondisjunction is more stable in megaspore mother cells and was approximately 26 per cent in the four progenies studied. Pollen viability did not seem to be associated with chromosome number, although a differential death rate appears to eliminate part of the embryo sac mother cells with two supernumerary chromosomes.

The chiasmatype theory of Janssens, C. E. McCLUNG (*Quart. Rev. Biol.*, 2 (1927), No. 3, pp. 344-366, figs. 13).—A presentation, discussion, and critical analysis of the chiasmatype theory, which is based on a breaking-up and recombination of chromatids in the tetrad.

✓ **Xenia in wheat** [trans. title], I. BLAIRINGHEM (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 5, pp. 389-391).—The immediate and hereditary results are noted of fertilization phenomena occurring among several wheat species.

Mutations: Their nature and evolutionary significance, R. R. GATES (*Amer. Nat.*, 61 (1927), No. 676, pp. 457-465).—Evidence from the literature is reviewed to indicate that mutations are of many kinds, some being spontaneous, others related to crossing, and others induced environmentally. Mutations are believed to have played an important part in the development of species and varieties in plants and animals.

An improved method of producing F_1 hybrid seeds of wheat and barley, C. E. ROSENQUIST (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 968-971, figs. 2).—A comparatively fruitful hybridization method which has been used successfully at the Illinois Experiment Station with wheat and with barley is termed the "approach method," and is a variation of the technique described by Jelinek (*E. S. R.*, 42, p. 636). It is especially adapted to greenhouse conditions, although it can be employed also in the field.

New wild-cultivated wheat hybrids [trans. title], I. BLAIRINGHEM (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 3, pp. 218-220).—Tabular showing is made of the results of 32 crossings between wild *Triticums* and the principal cultivated wheats as regards qualities considered significant.

Notes on a species cross in mice and on an hypothesis concerning the quantitative potentiality of genes, C. C. LITTLE (*Science*, 66 (1927), No. 1718, pp. 542, 543).—In crossing *Mus wagneri* males with *M. musculus* females at the University of Michigan the F_1 s were white-bellied, black agouti, and in many the proportion of black hairs on the dorsal surface was high, while on the ventral surface dark-tipped hairs were frequently found. The indication of a weakening of the agouti pattern, together with similar evidence from other species crosses, is taken as an indication of a quantitative potentiality of each gene adapted to the size of the body which it ordinarily covers. The hybrids were larger than the parent from which the agouti pattern was derived.

In the back-cross generation resulting from matings of F_1 males to dilute brown females there was an excess of black and intense animals. This is concluded to be due to the death of recessive color combinations.

Heritable characters of maize.—XXX, **Weak tassel**, H. M. YOUNG (*Jour. Heredity*, 18 (1927), No. 11, pp. 505-510, figs. 4).—According to the thirtieth of this series (*E. S. R.*, 58, p. 320), weak tassel, abnormal corn plants characterized by poorly developed tassels and ears, appeared in progenies of a pedigreed stock of sweet corn. It resembles the variations described by Woodworth (*E. S. R.*, 56, p. 518) and Jones (*E. S. R.*, 57, p. 823), except that the staminate spikelets on both of these are normally spaced, while the inflorescence in weak tassel has distinctly drooping branches with widely separated spikelets. Segregations indicate that this abnormality is inherited as a simple Mendelian recessive.

✓ **The factorial analysis of oats** [trans. title], O. MEURMAN (*Ztschr. Pflanzenzücht.*, 12 (1926), No. 1, pp. 1-29).—In crosses between a liguleless oats and different sorts having ligules the F_2 segregation occurred in 3:1, 15:1, and 63:1 ratios. Most common oats seem to require at least two factors for the ligule, while seed oats appear to possess only one. Crosses between oats with black and with yellow or white glumes showed F_2 segregation of 3 black:1 nonblack, and a cross between two brown kernalled sorts segregated 15 black or brown:1 nonblack. For the hypostatic gray color an intensifying factor (*Z*) seemed to exist, the gray being especially pronounced with *Z* present in homozygotic condition and lighter with *Z* heterozygotic. The waxy bloom observed on the glumes of many oats varieties appeared to be a dominant unifactorial character, the production of which may be modified by a special intensifying factor.

Milk secretion as influenced by inheritance, J. W. GOWEN (*Quart. Rev. Biol.*, 2 (1927), No. 4, pp. 516-531, figs. 3).—On the basis of results of cross-breeding experiments at the Maine and Illinois Experiment Station and in a Danish herd, together with statistical studies of parent and offspring production in purebreds, the author has shown that milk and fat production, as well as other constituents of the milk, appear to be determined in inheritance by multiple factors.

Linkage of short ear and density in the house mouse, W. H. GATES (*Natl. Acad. Sci. Proc.*, 13 (1927), No. 8, pp. 575-578).—In attempts to test the linkage relationship of the short-eared character in the mouse, previously noted by Lynch (*E. S. R.*, 46, p. 268), individuals of this strain were crossed with non-agouti, pink-eyed, dilute, brown, piebald waltzers. All expected classes, except dilute, short-eared young, appeared in the F_2 generation, which indicated linkage between density and the short-eared genes.

Further inter se matings of the F_2 s from short-eared dense \times normal-eared dilute, brown crosses produced only normal-eared dense, short-eared dense, and normal-eared dilute young in the approximate ratio of 2:1:1. Additional tests of F_2 , F_3 , and F_4 individuals also indicated complete linkage between the short-eared factor and density.

Six consecutive generations of brother to sister matings in White Leghorns.—A preliminary report on studies in inbreeding in poultry, H. D. GOODALE (*Poultry Sci.*, 6 (1927), No. 6, pp. 274-276).—The average production records and other characteristics of five generations of White Leghorns produced by brother and sister matings are briefly presented. It is pointed out that the several lines or sublines in the one surviving family are rather uniform for definite egg characters and for egg production.

Polyembryony in animals, J. T. PATTERSON (*Quart. Rev. Biol.*, 2 (1927), No. 3, pp. 399-426, figs. 48).—A review of cases of specific polyembryony in animals, based largely on invertebrates, insects, and the Texas armadillo.

The prenatal growth of the mouse, E. C. MACDOWELL, E. ALLEN, and C. G. MACDOWELL (*Jour. Gen. Physiol.*, 11 (1927), No. 1, pp. 57-70, figs. 3).—From a study of the records of the weights of 959 mouse embryos examined at different stages of maturity, and from a comparison with prenatal growth in the guinea pig and chick as reported by others, it was found that prenatal growth can be expressed most accurately by straight line relations between the logarithms of the weight and the age from the beginning of the formation of the embryo proper, which is considered as the primitive streak stage.

It was also found that the variability in weights for embryos of any age overlapped the weights of embryos one day older or one day younger sufficiently to indicate that there was as much as 24 hours' variation in the interval between copulation and the fertilization of the ova. The velocity constants for the animals used were similar, though differences in the formula for the growth curves depending on the amount of tissue in the first organization of the embryo and the length of the gestation period were apparent.

A study of the direct and indirect action of X-rays upon the tissues of the embryonic fowl, T. S. P. STRANGEWAYS and H. B. FELL (*Roy. Soc. [London], Proc., Ser. B*, 102 (1927), No. B 713, pp. 9-29).—In studies at Cambridge University of the effects of X-rays on the developing chick embryo, it was found that irradiation of 20 to 25-hour embryos caused an immediate reduction in the number of mitotic figures observed. After 80 minutes mitosis was almost absent and numerous cells were degenerating. After 24 hours the tissues had somewhat recovered and mitosis was frequent, though cystic and necrotic changes were conspicuous up to 6 days later.

X-raying of 6-day embryos reduced mitosis and caused some breaking-down of the cells and extravasation of blood into the tissues, and at 24 hours after treatment the majority of the cells had broken down. The effects on 17-day embryos were similar but less severe than on 6-day embryos.

Cultivating tissues *in vitro* from X-rayed 6-day embryos indicated that the irradiation had destroyed a limited number of cells, but that the bulk of the tissue was not killed. Death of the tissues in the 6-day embryos was, therefore, attributed to some indirect action such as clotting of the blood rather than to the direct action of radiation. Later experiments in which the developing embryos were kept in cold storage after irradiation bore out this hypothesis.

On the occurrence of the oestrous cycle after X-ray sterilisation.—Part IV, Irradiation of the adult during pregnancy and lactation; and general summary, A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B, 102 (1927), No. B 713, pp. 51-62*).—In continuing this series of studies (E. S. R., 57, p. 324), irradiation of female mice during pregnancy usually caused reabsorption or abortion, thus preventing the development of corpora lutea into the true persistent corpora lutea of pregnancy. Oestrus, therefore, occurred soon after irradiation.

Irradiation during lactation caused follicular disintegration, but did not affect the corpora lutea of lactation except in making them histologically permanent. Such corpora lutea, however, did not retain an oestrus-inhibiting power longer than the functional life of the normal persistent corpus luteum of lactation. Thus sterilization in the lactation period did not affect the duration of lactation.

A general summary of the series of papers is also included.

The failure of histamine to induce oestrous changes in spayed rats, P. M. LEVIN (*Amer. Jour. Physiol.*, 82 (1927), No. 1, pp. 19-21).—Efforts to induce, by the administration of histamine to four spayed rats, changes in the vaginal epithelium associated with oestrus were entirely negative.

The influence of high temperature on the guinea-pig testis: Histological changes and effects on reproduction, W. C. YOUNG (*Jour. Expt. Zool.*, 49 (1927), No. 2, pp. 459-499, figs. 10).—Treating the scrotum of 85 male guinea pigs for 30 minutes with water heated to 46° C. (115° F.) or for 15 minutes with water heated to 47° caused a degeneration of the germinal epithelium, which continued for about 12 days, when all the germinal tissue was destroyed except the Sertoli cells and some spermatogonia. Some epididymal sperms were very resistant to the heat injury and were capable of fertilizing ova 31 days after the treatment. If the heat treatment had not progressed sufficiently to destroy all the spermatogonia, the surviving cells became very active and regenerated the germinal epithelium with the production of spermatozoa by the forty-fifth day.

The treatment resulted in an increase in the number of sterile matings, which reached a peak between the forty-fourth and the seventy-fifth day after treatment. In 16 of 19 males, tested over a period ranging from 56 days to 1 year after the treatment, the reproductive capacity was regained.

Abnormal sexuality in animals.—III, Sex reversal, F. A. E. CREW (*Quart. Rev., Biol.*, 2 (1927), No. 3, pp. 427-441, figs. 2).—In continuing this series (E. S. R., 57, p. 723), the author has reviewed the literature showing that sex reversal may be the direct expression of genetic action. It may be brought about by the overriding of the genotype by agencies disturbing the general physiological conditions of the zygote at some stage or other in its development, or from a disturbance of the general physiology of the individual during embryonic life, or from a disturbance of the general physiology of the post-embryonic individual.

FIELD CROPS

[Report of the] Scottish Society for Research in Plant-Breeding, W. ROBB (*Scot. Soc. Research Plant Breeding Rpt.*, 1927, pp. 19).—Continued breeding work (E. S. R., 56, p. 334) with oats, potatoes, perennial rye grass, orchard grass, timothy, and swede turnips is reported on.

The effect of manuring a crop on the vegetative and reproductive capacity of the seed, B. V. NATH and M. SURYANARAYANA (*India Dept. Agr. Mem., Chem. Ser.*, 9 (1927), No. 4, pp. 85-124, pl. 1, figs. 12).—Experiments involving variously fertilized ragi (*Eleusine coracana*), millet (*Panicum miliaceum*), and wheat showed that the favorable effect of fertilizing a crop persisted in the seed and was apparent in the next crop when the seed was sown on a moderately fertile soil. A crop receiving manure gave seed with better cropping values, and, according to results of animal nutrition experiments by McCarrison (E. S. R., 52, p. 212) with higher nutritive value than that from a crop receiving mineral fertilizers. The latter surpassed untreated crops, the degree varying with the nature of the crop. The relative merits of fresh, fermented, and synthetic farmyard manure are indicated, and the stimulative effect of yeast on crop yields is shown.

Cross inoculation with cowpea and soybean nodule bacteria, O. H. SEARS and W. R. CARROLL (*Soil Sci.*, 24 (1927), No. 6, pp. 413-419).—In experiments at the Illinois Experiment Station cultures of legume nodule bacteria obtained by plate selection and single cell isolation produced nodules upon both cowpea and soy bean plants. All of the soy bean cultures tested could produce nodules on the roots of cowpeas, whereas some of the cowpea cultures infected the soy bean plant and others did not.

Wyoming forage plants and their chemical composition.—Studies No. 8, O. MCCREARY (*Wyoming Sta. Bul.* 157 (1927), pp. 91-106).—Further studies (E. S. R., 56, p. 134) dealt with changes in chemical composition with advance of season in irrigated forage plants, shading tests, the composition of plants furnishing winter forage in the Red Desert, and miscellaneous analyses.

The percentage of nitrogen in air-dry grasses and clover was highest when the plants were in the pasture stage and gradually decreased until the plant was dead. In a lesser degree fat and ash showed a similar trend. The dead grass plants may remain standing throughout the winter without much change in chemical composition. Their feeding value, differing little between species, seems but little better than that of oat straw.

Because of their later start and more rapid growth, grasses at the higher altitudes bloom soon after passing the pasture stage, and their chemical composition at blooming will be nearer to the pasture composition than is the case with plants at lower altitudes. This suggests why the high-altitude plants contain more nitrogen than the low-altitude plants at the same growth stage. The contents of nitrogen, fat, and ash showed that shading the plants prolongs the pasture stage, although crude fiber increased with the age of the plant, shaded or not.

Analyses of samples collected during winter in the Red Desert, an arid region of alkaline soil usable only for winter pasture, showed that the forage of the region is high in feeding value. The leaves of sagebrush after drying had the composition of a concentrate, and those of the salt sages had a nutritive value resembling that of the best alfalfa hay, while the dead grasses could serve as roughage.

[Field crops] work of the Scotts Bluff Field Station, 1922 to 1925, J. A. HOLDEN (*U. S. Dept. Agr. Circ.* 5 (1927), pp. 10-27, 28-30, figs. 4).—The progress of continued experiments in cooperation with the Nebraska Experi-

ment Station (E. S. R., 51, p. 135) is reported on for the period 1922-1925. The response of oats, potatoes, sugar beets, winter and spring wheat, and corn in irrigated rotations variously manured or including alfalfa has been noted from another source (E. S. R., 58, p. 30). The cash returns from the several crops grown in the different cropping are discussed.

The acre yields of sugar beets increased with the quantity of manure applied, 12 to 60 tons per acre, and the residual effect of the manure showed a similar trend in duration. Yields decreased with the lapse of time following the application. Beets yielded highest when planted the day after plowing, and in every test those on plowed land slightly outyielded those on disked land. The earlier plantings and also the earlier irrigations resulted in the higher beet yields.

Potato yields have been higher with each delayed digging until about September 1, when yields were similar, whereas quality varied, potatoes dug early being much better than those dug late. The results also showed that potatoes planted early should be dug early to avoid scab damage. Irish Cobbler appeared to be a better variety for the early market. Although early plantings have given the higher yields, the later plantings were less susceptible to disease and contained a smaller percentage of culls.

Crop rotation in the Blackland region of central Texas, E. B. REYNOLDS and D. T. KILLOUGH (*Texas Sta. Bul.* 365 (1927), pp. 21).—Rotation experiments during 11 years (1914-1924) on unfertilized black soil at the Temple Substation showed that cotton in rotations produced 94 and 101 per cent more lint than that in continuous culture, corn in rotations 58, 70, and 87 per cent more, wheat in rotations 35 and 55 per cent more, and oats in rotation 17 per cent more than in continuous culture. Root rot killed 4.8 per cent of the cotton plants in the 4-year rotation, cotton, cowpeas, corn, and wheat, and 39.7 per cent in continuous cotton. For the 3-year rotation, cotton, corn, and oats, and for continuous cotton, the average losses were 6.3 and 31.9 per cent, respectively. This 3-year rotation rendered a greater comparative net profit than any other system tested, although the 4-year rotation above gave larger yields of cotton and wheat. The several advantages of rotations are listed, and their possible application to conditions in the central Texas blacklands are discussed briefly.

[**Field crops work in Porto Rico in 1926**], D. W. MAY and R. L. DAVIS (*Porto Rico Sta. Rpt.* 1926, pp. 3-5, 22-24, 25, 26, figs. 3).—In further trials of forage grasses (E. S. R., 57, p. 425) Uba cane has yielded heavily, usually producing more feed than any other forage crop tested at the station. Guatemala, next in yield, was also highly relished by stock. When cut near maturity, Uba cane averaged 54.7 tons per acre, and 27.5 per cent was uneaten by stock when fed whole and 13 per cent when cut; Guatemala grass 35.4 tons and 21 and 18.5 per cent; elephant grass 32.6 tons and 55 and 50 per cent; Guinea grass 17.4 tons and 27 and 37 per cent; and Para grass 19.6 tons and 30 and 26 per cent respectively. The adaptations of these grasses are noted briefly. Java grass (*Polytrias praemorsa*) has been hardy, aggressive, better adapted to lawns than any other grass tested, drought resistant, and appears of value for upland pastures and hillsides.

Corn breeding work continued to show the superior qualities of Castillear-1 and selfed lines derived therefrom. The prolific tendency in selfed lines as well as vigor of growth and yield seem to be strongly correlated in Porto Rico corn, seven of the eight most prolific selfed lines being also the largest and highest yielding. Four of six hybrids between selfed lines outyielded the bulk native check, the superiority being due to increased prolificacy rather than size of ears. The merits of imported varieties and of corn from different localities in Porto Rico are discussed.

Counts of composite 0.1-gm. samples showed Uba cane to average 12,590 seed (individual flowers) per arrow, while those of P. O. J. 2725, S. C. 12/4, and H. 109 ranged between 27,000 and 34,000. The number per gram is fairly constant. Results of studies in the production of sugar cane seedlings have been detailed in a previous note (E. S. R., 55, p. 640).

Cereal experiments at the Fort Hays Branch Station, Hays, Kans., 1912 to 1923, A. F. SWANSON (*U. S. Dept. Agr., Tech. Bul. 14* (1927), pp. 56, figs. 24).—Experiments during the above period, in cooperation with the Kansas Experiment Station, comprised variety trials with winter and spring wheat, and barley, oats, emmer, rye, grain sorghums, sorgo, corn, and flax, and cultural tests with winter wheat and grain sorghum. Environmental and climatic conditions at the station and in its vicinity are described, and the relation of crop yields to the type of farming is discussed briefly.

Varietal leaders included Kanred and Blackhull (E. S. R., 57, p. 433) winter wheat; the durum spring wheats, Acme and Kubanka; Fulghum, Burt, Kanota, Red Rustproof, and Burt×Sixty Day oats; early barleys, such as Club Marlout, Stavropol, Flynn, and Coast; Dwarf Yellow milo; and Freed, Sherrod, and Cassel white dents, and Bloody Butcher corn.

From September 20 to October 1 appeared to be the optimum period for seeding winter wheat, with an acre rate of not less than 4 pk. Good yields followed favorable moisture and temperature conditions at planting time. The use of the furrow drill resulted in no outstanding advantage over the common drill in yield or in preventing soil blowing, and gains from north-south seeding over east-west seeding with either type of drill were not significant. Light applications of straw, 1 to 2 tons per acre, as a top-dressing on winter wheat on fall plowed land or fallow seemed beneficial. With Dawn kafir the best stand appeared to result with plants from 6 to 12 in. apart in 40-in. rows.

Fertilizer tests with buckwheat [trans. title], BÖCKENHOFF-GREWING (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, 6 (1927), No. 10, B, pp. 473, 474).—Preliminary trials during two years showed a depressing effect on grain yields, and also on total yields of buckwheat from increasing applications of potassium chloride, whereas up to a certain limit both total and grain yields usually rose with increasing applications of potassium sulfate.

Cotton growing in southern Africa and the Rhodesias, J. CURRIE, J. S. ADDISON, and H. C. JEFFEYS (*London: Empire Cotton Growing Corp.*, 1927, pp. [I]+30, pls. 9).—A report of the status and prospects of cotton production in the region indicated.

Field trials of Jerusalem artichokes ([*Gt. Brit.*] *Min. Agr. and Fisheries, Intel. Dept. Rpt. 1924-1926*, pp. 24, 25).—Trials at four centers with Jerusalem artichokes resulted in an average production of 2.6 tons of stalks per acre. While the tubers replaced meal for pigs with some success, carcasses of pigs fed on artichokes were distinctly inferior to those fed on potatoes. Demand for human use was very limited. Harvesting costs were high, and the crop did not promise to withstand distant rail shipment.

Registration of varieties and strains of oats, II, T. R. STANTON, H. H. LOVE, and E. E. DOWN (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 1031-1037).—The characteristics and performance of oats varieties approved for registration since the previous list (E. S. R., 56, p. 433) are described briefly.

Specific gravity selection of sugar beets, D. A. PACK (*Facts About Sugar*, 22 (1927), No. 53, pp. 1231, 1232, figs. 2).—The problem is reviewed as to purposes, methods, and results. A comparison indicated that there is no significant difference in the accuracy of the salt solution method whether the whole beet or a part is submerged if the procedure outlined be followed.

The registered varieties of American wheat: Their class, origin, and acreage. J. A. CLARK (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 953-968).—This paper lists 252 registered wheat varieties showing their registration number, commercial class, method and agency of origin, and estimated acreage in the United States in 1924. The hard red spring wheats occupied 22.4 per cent of the total wheat acreage of the United States in 1924, and there are 39 registered varieties in this class, durum wheats 8.2 per cent and 15 registered varieties, hard red winter wheats 41.4 per cent and 26 registered varieties, soft red winter wheats 22.1 per cent and 85 registered varieties, and white wheats 5.9 per cent of the acreage and 75 registered varieties. Of the registered varieties 83 are indicated as foreign introductions, 111 developed by selection, and 58 originated through hybridization. At least 50 improved sorts important commercially were grown on a total of over 20,000,000 acres in 1924, while nearly two-thirds of the acreage has continued to be grown to old standard varieties.

Registration of improved wheat varieties, II. J. A. CLARK, J. H. PARKER, and L. R. WALDRON (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 1037-1041).—Five sorts of wheat approved for registration are listed supplementing previous reports (E. S. R., 56, p. 433).

Varying characteristics of three types of wheat grown under the influence of identical environment.—II. The 1926 crop, R. S. HERMAN (*Cereal Chem.*, 4 (1927), No. 6, pp. 436-448, figs. 6).—Milling and baking tests were made on samples of the 1926 crop of Kharkof, Blackhull, Kanred, and Turkey wheat from plats at the Kansas Experiment Station similarly to those reported on the 1925 crop (E. S. R., 56, p. 340).

Physical examination indicated the Blackhull sample to be the most desirable, whereas analyses revealed no pronounced variations aside from the protein content and the viscosity measurements, which favored the Kanred. Milling qualities were similar in regard to yields and percentages, Kharkof being slightly the more desirable. The middlings and bran were similar in character on Kanred, Kharkof, and Turkey, while the Blackhull middlings particles were larger and softer and the bran was decidedly thicker. The grain structure, particularly of all loaves baked under the fixed method, was inferior to the normal, while under the same methods Kanred consistently produced loaves of the largest volume and Blackhull loaves of the lowest volume. When a sponge of a commercial type was mixed and fermentation time was varied the loaf volume varied 3.1 per cent between the varieties, being highest and identical for Kanred and Blackhull. The absorption of flour from Blackhull wheat was slightly less than that of the other flours, and indicated tendencies toward slackening in the dough during fermentation in all the test bakes.

✓ **The hardness of the wheat kernel in relation to protein content.** R. NEWTON, W. H. COOK, and J. G. MALLOCH (*Sci. Agr.*, 8 (1927), No. 4, pp. 205-219, figs. 3).—Tests at the University of Alberta on Red Fife, Renfrew, Marquis, Ruby, and Huron common wheat and Kubanka durum grown at 6 stations in western Canada involved a device for cracking wheat kernels transversely which gives an accurate and convenient quantitative measure of hardness.

Size of kernel, expressed either as diameter or volume, markedly affected the cracking strain, but this effect was largely eliminated by expressing hardness as strain per millimeter of diameter. In a given sample the vitreous kernels appeared to be harder and to contain more protein than the starchy kernels, although a linear correlation between hardness and protein content could not be demonstrated over a series of samples, this resembling results of previous investigators. The disturbing factors seemed to be environmental effects. A

curved relationship between percentage of vitreous kernels and protein content was apparent.

The moisture content of the kernels of Marquis and Standup, containing 18.2 and 10.2 per cent of protein, respectively, had little effect on their hardness over a range of from 2 to 11 per cent of moisture, although beyond this range hardness tended to decrease.

The influence of fertilizers on the vitamin-B content of wheat, C. H. HUNT (*Ohio Sta. Bul. 415* (1927), pp. 41, figs. 5).—Trumbull winter wheat from four consecutive crops on the 5-year rotation fertility plats which had received superphosphate (acid phosphate), sodium nitrate, and potassium chloride, alone and in combinations, for an extensive period was ground finely and fed to rats in an otherwise complete diet.

Results for the first 3 years, 1923, 1924, and 1925 crops, showed no relation between the vitamin B content of wheat, judged by the rate of growth of the animals, and the kind of fertilizer applied to the soil on which the wheat was grown. From the viewpoint of reproduction there were some indications that a high vitamin B content of wheat is associated with a fertilizer containing superphosphate. Using the curative method of study, wherein the wheat was fed separately, data were obtained from the 1926 crop that were in harmony with the reproductive records of the previous years. Indications were that superphosphate alone or a complete fertilizer containing superphosphate, potassium chloride, and sodium nitrate produces wheat with the highest vitamin B content. In two of the three years potassium chloride and sodium nitrate together produced wheat of the lowest vitamin B content. There were indications that the climate significantly influenced the vitamin B content of wheat and may be the cause of annual variations in the results. No evidence was had that spring wheat contained more vitamin B than winter wheat.

The effect of feeds low in minerals and the characteristics of the several vitamins are discussed briefly.

The agricultural value of hard seeds of alfalfa and sweet clover under Alberta conditions, C. W. LEGGATT (*Sci. Agr.*, 8 (1927), No. 4, pp. 243-264, 265, 266, figs. 5).—Plat trials at Lethbridge, Lacombe, and Brooks, Alberta, supplemented by laboratory tests, indicated that hard seeds in Grimm alfalfa were about as valuable as the permeable seeds from the viewpoint of number of plants produced. Heavy scarification was detrimental to field germination, and plants from scarified seed seemed less winter-hardy than those from hard seed. While permeable seed germinated sooner, the hard seeds overtook them about midsummer. Hard seed germination seemed to be favored by limited soil moisture and high temperature. The relative value of the hard seed of alfalfa was found to vary from 70 to 85 per cent at the end of the first season (1925). Where the value of the hard seed was 85 per cent this value rose to 94 per cent after wintering, although additional germination was practically negligible.

Permeable seeds of sweet clover germinated more promptly and more completely than the hard seed, although the latter soon attained their maximum germination, which was about 50 per cent of that of the permeable seed. With the later dates of seeding (at Lacombe), mortality was lower in the plats and hard seeds had a higher relative value.

A new mathematical method for computing the most probable values for the field germination of the hard and permeable seeds is described.

Pennsylvania weeds: Their control and eradication, E. M. GRESS (*Penn. Dept. Agr. Bul. 448* (1927), pp. 34, figs. 18).—A number of noxious weeds found in Pennsylvania are described, and control methods are outlined.

HORTICULTURE

Statistical methods in horticulture, K. SAX (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 141-149).—A discussion of various statistical methods which have been found to be of value in horticultural experimentation.

The use of electricity in horticulture [trans. title], G. KLEIN (In *Festschrift der Österreichischen Gartenbaugesellschaft, 1827-1927.*, Vienna: Julius Springer, 1927, pp. 33-53, figs. 18).—Increasing the length of light exposure by the use of strong electric lamps stimulated growth and brought into early flowering various species grown both from cuttings and from seed. Light requirements differed with species but were regulated by placing the plants at different distances from the lamps.

Further localization of the response in plant tissue to relative length of day and night, J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 67-70).—The narrow localization of the effect of varying the length of day was shown in cosmos. A branch tip covered July 25 with black silk bloomed September 19, while uncovered buds did not bloom until late October. Determinations of the catalase activity in the tips of covered and uncovered branches showed the former to be much less active, the odds in favor of the difference being significant, being over 9,999 to 1. Comparing the effect of 10 and 17 hours of light exposure in the greenhouse, catalase activity was again notably less in the short-day buds. Determinations of catalase activity in the adjacent pair of leaves inclosed with the tip showed no such conspicuous lowering of activity following covering, showing a highly localized response to changes in day length. Evidence of increased activity was recorded in the first node below the covered tip.

Chemical stimulants and germination of seeds, F. KOTOWSKI (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 173-176).—Working at the University of California, the author found that soaking the seeds of peppers, spinach, and parsnips in certain solutions apparently increased the percentage of germination but had no influence on the rapidity of germination. For example, pepper seeds soaked for 48 hours in a 1.5 per cent solution of $MgCl_2$, $NaNO_3$, and $MnSO_4$ gave in 20 days at a constant temperature of 25° C. (77° F.) 81, 84, and 80 per cent of germination as compared with 78 per cent for seeds soaked in distilled water. The treatment of spinach seeds gave even more striking results.

Temperature relations to germination of vegetable seed, F. KOTOWSKI (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 176-184).—A report on studies at the University of California in which the percentage of germination and the speed of emergence of the seedlings at constant temperatures of 39.2, 46.4, 51.8, 64.4, 77, and 86° F. were recorded for 17 species of vegetables.

Speed of germination increased for all species in accordance with rising temperature, but certain cold resistant kinds, namely, spinach, lettuce, cabbage, parsley, and beets, gave higher germinations at the lower temperatures, the optimum temperature for spinach being 39.2°, cabbage 46.4, and beet 51.8°. It is suggested that the rapidity of growth of seedlings may depend on the velocity of the chemical reactions which are responsible for the characteristic metabolism of each kind of germinating seed.

Cold storage investigations with fruits and vegetables [trans. title], R. PLANK (*Beihfte Ztschr. Gesam. Kälte-Indus.*, 3 (1927), No. 2, pp. 49, figs. 20).—As a result of cold storage studies the author presents a table of optimum temperatures and humidities and length of keeping period for various vegetables and fruits, including the asparagus, tomato, bean, strawberry, gooseberry, plum, pear, cherry, and grape.

Storage investigations with fruit and vegetables, F. KIDD and C. WEST ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 62-67, fig. 1).—The value of wrapping apples in oiled paper was shown in the case of Newton Wonder, a scald susceptible variety. After 4.5 months in ordinary storage fruits in oiled paper contained about 48 per cent of sound individuals as compared with 5 per cent for waxed paper and 3 per cent for unwrapped fruits. With Bramley Seedling, a nonscalding variety, waxed paper was as effective as oiled paper. Paper had little effect on the storage of Conference pears. At 34° F. pears kept for 30 weeks as compared with 10 weeks at 39°. The nature of the orchard soil had an important bearing on the storage life of Bramley Seedling apples held at 34°. Fruits grown on heavy silt kept 34 weeks as compared with 16 weeks for those from a very light soil. Bramley Seedling apples wrapped in oiled paper and held in cold storage at 34°, gas storage at 50°, and ordinary storage showed 74, 78, and 33 per cent of sound fruits, respectively, at the beginning of March.

The minimum temperature level at which apples can complete their normal storage life was found to vary with varieties. For Bramley Seedling and King Pippin 37 and 40° were the most favorable temperatures, but for Newton Wonder storage life increased down to 30°. Certain vegetables, peas, asparagus, and cauliflower were stored satisfactorily by freezing.

Temperature conditions in refrigerated holds of ships carrying fruit, A. J. M. SMITH ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 55-59).—Great variability was observed in the temperature of various parts of ships' holds loaded with fruit, differences as great as 10° F. being found. Attempts to force horizontal circulation of cold air were only partially successful on account of its tendency to sink. The most uniform cooling was obtained with overhead refrigeration dependent on gravitational movement alone. Penetration of cold is so slow that for several days following loading a rise in temperature in the central region of the cargo often occurs. Electrical distant reading thermometers installed at inaccessible points are considered a necessity.

[**Horticultural investigations at the Porto Rico Station**], D. W. MAY, T. B. McCLELLAND, R. L. DAVIS, and H. C. HENDRICKSEN (*Porto Rico Sta. Rpt. 1926*, pp. 6-10, 14-22, 24, 25, 26, 27, figs. 7).—Cacao curing is discussed as in the preceding report (*E. S. R.*, 57, p. 435). The development of aroma in the cacao bean was found to be dependent upon the action of enzymes. The inner husk of the cacao pod and the pulp surrounding the bean apparently exert their chief benefit by sealing the bean. Cultures of yeast, acetic, lactic, and Bulgaric acid-forming bacteria had a deleterious effect on quality. Thoroughly ripe beans dried at sufficiently low temperatures to prevent destruction of the enzymes are requisite to quality. Soaking beans for from 1 to 3 days in 5 per cent solutions of potassium alum, calcium chloride, magnesium chloride, ammonium alum, sodium chloride, and ammonium sulfate gave in the order presented favorable results.

Notes are given on the care of garden soils and the selection of varieties and species of vegetables and flowers adapted to Porto Rico conditions.

Of four species, beans, sweet potatoes, pineapples, and onions, studied in their response to length of day modifications, onions gave the most striking results. Under day lengths slightly less than normal for Porto Rico, White Bermuda, Prizetaker, Yellow Globe Danvers, and Silver King failed to form bulbs. Even under day lengths typical of the longest on the island Yellow Globe Danvers refused to develop bulbs, as did likewise the majority of Prizetaker and some of the Silver King plants. Long days apparently retarded the blossoming of the Red Spanish pineapple.

A mixed planting of *Crotalaria juncea*, *C. striata*, *Tephrosia candida*, *Gliricidia sepium*, and *Erythrina berteroana* furnished good shade for coffee. *Gliricidia* outgrew the other plants and was selected as permanent shade. *Erythrina* showed special value on account of its rapid growth. Yields from the several plats again showed the value of potassium for coffee, for all plats receiving potassium singly or in combination exceeded the controls, and of the 15 leading plats 13 received potassium. In fertilizer tests at Las Vegas fertilized coffee plats averaged during the 5 years, 1921-1925, 155 lbs. per acre per year increase above the controls, returning a fair profit from fertilizers. Planting of coffee seeds in various positions failed to show any effect of planting on the shape of the taproot.

Fertilizer tests with coconuts at Corsica failed to give satisfactory results, and at San Jose yields were so variable between individual palms receiving like treatment that no worth-while records were secured. Variety tests with beans are discussed.

Mildew seriously interfered with melon breeding studies in which an attempt is being made to combine the superior qualities of the native and imported melons. Station seedling tomatoes were carefully tested and pineapple investigations continued.

[Horticultural investigations conducted by the Philippine Bureau of Agriculture] (*Philippine Bur. Agr. Ann. Rpt.*, 26 (1926), pp. 30-44, pls. 8).—This is the usual annual report (*E. S. R.*, 57, p. 335).

Ammonium sulfate proved a much better source of nitrogen for mandarin orange trees at Tanauan than did copra meal. A combination of guano, potassium sulfate, and bone meal gave the best results in fertilizing Excelsa coffee. In a variety test of coffees, Liberian, Excelsa, and Dybowski were the most productive in the order given. A comparison of crowns, suckers, and slips for propagating pineapples showed the crowns to be best. As for coffee, guano, potassium sulfate, and bone meal mixture proved most effective for the pineapple.

The effect of fertilizers on the solidity of cabbage heads, W. B. MACK (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 70, 71).—Measurements taken in 1921 and 1922 at the Pennsylvania Experiment Station on the solidity of cabbage heads as determined by weight and displacement in water showed no significant differences attributable to fertilizer treatment. No relation could be established between the specific gravity of the heads and the moisture content of the soil of the several plats. Determinations in 1926 of specific gravity by weighing heads in air and in water showed significant differences in solidity between two fertilizer treatments, 40 tons of manure per acre on the one hand and 1 ton of complete fertilizer on the other. However, since the two plats were widely separated their comparable nature is questioned, leading to the general conclusion that fertilizer treatments have had little or no effect on the solidity of cabbage heads.

Some observations on the response of greenhouse cucumbers (*Cucumis sativus*) to certain environmental conditions, V. A. TIEDJENS (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 184-189).—Suspecting the importance of good drainage in cucumber houses where the plants were suffering from wilting and producing unsatisfactory crops despite high fertility and copious watering, the author studied at the Massachusetts Experiment Station the effect on cucumbers of varying the water supply. In well drained soils heavy watering caused no injury, but in the case of plants growing in tubs those without drainage bore 70 per cent of cull fruits and the roots upon examination were found to lie near the surface. At the same time comparable plants supplied with good

drainage or kept near the dry point bore excellent fruits. Since no nitrates could be found in the stems of the poorly drained lot, it is assumed that the plants were unable to absorb soil nutrients or that the nutrients were converted into some unavailable form.

Comparing ordinary garden soil with a half and half mixture of soil and manure, much better success was obtained with the soil, suggesting the possibility that manure increased the water-holding capacity to a harmful degree.

Liming onions, J. P. JONES (*Massachusetts Sta. Bul.* 237 (1927), pp. 139-145, fig. 1).—Correlating the results of acidity determinations made upon the soil of 114 fields of set onions located in Hampshire County with yields and the vigor of the plants there was found a close association between acidity and yield and between acidity and vigor. Approximately 50 per cent of the fields were found too acid to grow a maximum crop. Onions following tobacco were in general very poor, suggesting that this crop rotation should not be followed.

That lime applied only to the surface soil may not become quickly available was shown in acidity determinations. Only when the lime was applied to both sides of the furrow slice were the readings at 3- and 6-in. depths equal. Suggestions are given upon the use of lime.

Factors influencing the yield of apples in the Cumberland-Shenandoah region of Pennsylvania, Virginia, and West Virginia, C. R. SWINSON, F. P. WEAVER, A. J. DADISMAN, J. J. VERNON, H. P. GOULD, and J. B. KINCEB (*U. S. Dept. Agr., Tech. Bul.* 54 (1927), pp. 26, figs. 12).—Based on analysis of data collected on a total of 14,735 acres, representing over 500,000 trees, it is concluded that the region surveyed is as a whole well adapted to apple growing, but that in many cases poor sites have been chosen where exposure to cold winds and lack of air drainage have often resulted in severe losses. The occurrence of abnormally warm weather during the period February 7 to March 21 invariably results in the premature development of fruit buds with injury from late frosts in orchards located on unfavorable sites.

Orchard management practices were found to average low in grade throughout the region and are deemed to be the cause of losses often attributed to frost and biennial yielding habits. In many cases trees were found to be planted too closely, with the result that the lower limbs have suffered injury. The minimum recommended spacing is 40 ft. by 40 ft. The planting of self-sterile varieties in large blocks and in isolated areas has been a cause of poor yields. In many cases orchards were found on thin soils closely underlaid with rock, a condition favorable to drought injury.

Propagation of apple by root cuttings and layers, G. E. YERKES (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 93-98).—Asexual propagation was successfully employed by the U. S. Department of Agriculture in increasing desirable apple seedling stocks. No one method was found universally satisfactory, both root cuttings and layers being employed. The methods used in handling cuttings in the greenhouse and field and the methods employed in mound and trench layering are discussed in considerable detail.

A quantitative study of the effects of transplanting and of budding upon the growth of apple seedlings, C. F. SWINGLE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 99-104).—Measurements taken at the U. S. D. A. Horticultural Field Station, Glenn Dale, Md., showed that budding and transplanting have a marked reducing effect on the growth of young apple seedlings. The importance of vegetative propagation for apple stocks was shown in the great variability in the growth of seedlings. Of 380 apple seedlings 66 showed burr knots at the end of the seventh year, but that this condition was not associated with weak-

ness was indicated in the fact that the average diameter of the 66 trees was 1.69 in. as compared with 1.33 in. for the remainder of the 380 trees.

Cutting back young apple trees to short stumps, T. J. TALBERT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 104-107).—Favorable results secured in cutting back rabbit injured apple trees just as growth commenced and disastrous results obtained from severe cutting in May of hail injured trees led to a series of experiments at the Missouri Experiment Station in the cutting back of young apple trees. The results showed beyond question that early spring just at the time growth is starting is the best time for cutting back trees, the mortality increasing as the season advanced. Almost invariably cut back trees produced lower and better placed branches than the original tree. The effect on the beginning of fruiting was undetermined, but it was found that within from three to four years cut back trees were practically as large as the untreated.

Head formation in apple trees, J. K. SHAW (*Massachusetts Sta. Bul.* 238 (1927), pp. 147-177, figs. 19).—Of six types of pruning, (1) globular head headed back, (2) globular head not headed back, (3) no pruning, (4) modified leader, (5) leader headed back, and (6) leader not headed back, employed in shaping young apple trees, the modified leader gave the best results. Records taken on the weight of trees removed after six seasons' growth failed to show any outstanding differences between treatments. Adding the weight of prunings to that of the trees, the averages for the six groups were 63, 67, 75, 69, 64, and 77 lbs., respectively. The trunk girths were also quite uniform. Total yield records from 1922 to 1925 show for McIntosh, the earliest fruiting and highest producing variety, 160, 141, 197, 256, 140, and 223 lbs. of fruit.

The moderate pruning required in thinning out trees did not dwarf growth nor reduce yields to any extent except where heading back was practiced. Heading resulted in a denser top, more erect growth, more shoots the succeeding year, and less bloom and less fruit. Since most of the unpruned trees assumed the modified leader form, it is suggested that this is the natural tendency for most apples. Light and intelligent pruning is deemed necessary to the production of satisfactory, uniform trees.

Supplementing the experimental results, the author illustrates the different types of head, outlines necessary pruning for securing the same, and discusses in a practical way the underlying principles and methods of pruning apple trees.

The effect of fruiting on the growth of Oldenburg apple trees, W. H. CHANDLER and A. J. HEINICKE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 36-46).—As shown in earlier work with the Concord grape (*E. S. R.*, 56, p. 238), fruiting apparently reduced the rate of growth in the Oldenburg apple and the Poorman gooseberry. In the Oldenburg apple defoliated, unpruned trees were larger as measured in dry weight of roots and top than those of any other treatment and also led in the formation of fruit buds. The growth differences between defoliated and fruiting trees were decidedly more marked in the pruned than in the unpruned lots. Except with pruned Oldenburg apple trees, the residue of dry matter, fruit included, from a given leaf area was considerably larger in fruiting than in defoliated trees, a fact believed explainable in part by photosynthetic activity in the fruit itself and by a more rapid photosynthesis in the given leaf area. In fruiting trees and in those making a large percentage annual increase in dry weight less of the annual product of photosynthesis was apparently used in respiration.

The set of fruit as influenced by pruning at different periods preceding the bloom, A. J. HEINICKE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 46-48).—Noting that heavy pruning induced fruit setting in 20-year-old Anjou pears and in vigorous 17-year-old Rhode Island apples, both of which had bloomed

abundantly but failed to set fruit prior to treatment, the author suggests the possibility that disturbing the balance between tops and roots provided more favorable water relations, thus preventing incipient wilting during the critical period when fruit abscission occurs. That the inability to set was not a matter of nutrients was indicated in the fact that applications of nitrogen failed to induce setting in the pear. In the case of a 12-year-old Rhode Island orchard, pruning had an opposite effect, the control trees alone bearing a crop of fruit, but examination showed that pruning had removed the fruiting shoots.

A relation between the respiratory activity and the keeping quality of apples, F. KIDD and C. WEST ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 37-41, figs. 5).—Records taken on the storage life at 34° F. of Bramley Seedling apples grown on fenland, gravel, and silt soils showed 168, 195, and 312 days from the date of harvest to the time that 50 per cent of the fruits had decayed for the several lots. Periods up to 10 per cent of decay were 130, 80, and 200 days, respectively. Frequent determinations of the respiratory activity of the fruits showed an inverse relation between respiratory activity and the length of the storage life. At 46.5° the silt grown apples kept longest, with the position of the fenland and gravel soil lots reversed from that at 34°.

A relation between the concentration of oxygen and carbon dioxide in the atmosphere, rate of respiration, and length of storage life in apples, F. KIDD and C. WEST ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 41, 42).—Comparing the rate of respiration, as measured by loss of weight, of apples stored in air and in gas (12 per cent CO₂ and 9 per cent O₂) it was found that respiration was approximately halved and the length of storage life approximately doubled in gas storage. The relations between O₂ concentration and the respiration rate as determined by the amount of CO₂ evolved were for 10 and 5 per cent of O₂ 0.86 and 0.78, respectively, as compared with unity for normal air.

A relation between the sugar and nitrogen content of the apple at the time of gathering and the length of its subsequent life in storage, D. HAYNES and H. K. ARCHBOLD ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 42-45).—Analyses of Bramley Seedling apples at intervals during their growth showed the uptake of nitrogen to occur during the first few weeks following setting. Of apples from fenland, gravel soil, and silt, the fenland fruits contained much the highest percentage of nitrogen. It is believed that the demand that an apple makes on its stores of respirable material is regulated almost entirely by its nitrogen content, thus accounting for the poor keeping quality of the fenland apples. Sugar intake is deemed to be largely dependent on seasonal conditions during the growing period. Apples from the silt soil were high in sucrose and low in nitrogen, conditions apparently favoring long keeping. In storage at 34° the supply of sucrose is believed to be the limiting factor in the life of the apple. When the supply of sucrose in process of inversion gives out, acids are drawn upon but can not entirely offset the deficiency, and internal breakdown results.

Pectic changes in apples and pears, A. M. EMMETT ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925-1926*, pp. 47-49, figs. 3).—The general chemical processes in stored pears were found very similar to those in apples. In pears stored at 39° F. there was a steady decrease in total pectic content during the entire storage period. Low temperature (34°) tended to inhibit the development of soluble pectin in pears much more than in apples, a difference believed to explain the contrasting behavior of pears and apples in storage. In pears at 39° practically the whole of the cell wall losses were due to pectin losses, whereas in the apple, even at 34°, cell walls suffered other

losses presumably by hydrolysis of the cellulose, suggesting differences in the nature of the pectin cellulose compounds in the cell walls of the pear and apple.

Self sterility in Zealand cherries [trans. title], A. M. SPRENGER and A. K. ZWEEDE (*Landbouwk. Tijdschr. [Utrecht]*, 39 (1927), No. 468, pp. 350-363, figs. 4; *Eng. abs.*, p. 363).—Klerk and Hollander, the two principal cherry varieties of Zealand, were found in studies at the Wageningen Horticultural Laboratory to be self-sterile but interfertile. The variety Zoete Morel proved an effective pollinizer for both Klerk and Hollander.

A preliminary study of the fruiting habit of the Worden grape, W. F. PICKETT (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 135-138).—Studies at the Kansas Experiment Station upon Worden grapevines pruned according to the two-cane Kniffin system showed so little correlation between the length of cane and production and between the diameter of the cane and production ($r=0.1456 \pm 0.086$) that the careful selection of canes at pruning time is not deemed necessary.

Grapes for export: A packing experiment, B. KRONE (*Jour. Dept. Agr. Victoria*, 25 (1927), No. 11, pp. 689, 690).—South African Ohanez grapes harvested in late March and early April and packed in boxes with sulfite tissue paper and wood wool kept at a temperature of 32-33° F. in excellent condition for over 5 months, while at the close of the period comparable lots in sterilized granulated cork began to show wastage. The tissue paper and wood wool material was much less costly than the cork.

The production of hybrid Palestine iris corms, D. GRIFFITHS and E. O. ORPET (*U. S. Dept. Agr., Tech. Bul.* 11 (1927), pp. 15, figs. 4).—Information is presented upon the origin, early history, methods of propagation, culture, utilization, pests and their control, and principal varieties of the Palestine irises, said to possess high desirability for American gardens and thriving particularly well on the Pacific coast.

FORESTRY

A manual of woodlot management, C. J. TELFORD (*Ill. Nat. Hist. Survey Bul.*, 17 (1927), Art. 2, pp. 97-194, figs. 11).—Beginning with a general discussion of the forestry situation and the importance of land classification, the author outlines in a popular way the various silvicultural practices, planting, protection, thinning, and marketing of products designed to keep the farm woodlots of Illinois in a permanently productive and profitable condition.

The effect of position of roots upon the growth of planted trees, E. G. CHEYNEY (*Jour. Forestry*, 25 (1927), No. 8, pp. 1013-1015).—Records taken after four seasons upon the comparative height growth and development of *Pinus strobus*, *Thuja occidentalis*, and *Picea pungens* seedlings, part carefully planted with roots spread and part with roots rolled in a ball, failed to show any material advantage from the careful planting, leading the author to suggest that perhaps too much stress has been placed in the past upon the necessity of careful planting.

Correlation between length and width in the annual growth of *Pinus densiflora* and *P. thunbergii* [trans. title], K. MORIKAWA (*Bul. Sci. Fakult. Terkult., Kjušu Imp. Univ., Fukuoka, Japan.*, 1 (1925), No. 5, pp. 292-309, figs. 8; *Ger. abs.*, pp. 308, 309; *Ger. abs. in Japan. Jour. Bot.*, 3 (1927), No. 3, p. (58)).—Length expansion of buds was observed to begin about the end of February and to be completed in early July, whereas thickening commenced in early March and ended in October. The elements of winter buds were laid down the end of April and became visible about May 20. No thickening of the new growth occurred during the period of formation of the winter buds. As

any interference with either width or length growth affected the other to a certain extent, the author suggests that there is a limited correlation occurring between these two forms of growth.

A modification of Bruce's method of preparing timber-yield tables, L. H. REINEKE (*Jour. Agr. Research* [U. S.], 35 (1927), No. 9, pp. 843-856, figs. 8).—Alignment charts are proposed as a means of expressing the conventional system of curves employed by Bruce (E. S. R., 55, p. 144) in the preparation of timber yield tables. Among the advantages resulting from the derivation of alignment charts directly from the basic data are the reduction in the number of curves to be fitted, with a consequent increase in definition of each curve and the saving in labor made possible by the ease of interpolating the alignment charts for any age and site index. The alignment chart form permits the presentation of final results in a condensed form.

An additional cross check between height, stand, basal area, cubic volume, and forest form factor is incorporated, and several minor errors of Bruce's methods are corrected. The modified method as proposed has the disadvantage that partial stand values can not be read directly but must be obtained by conversion with certain factors.

DISEASES OF PLANTS

The field survey as a basis for the phenological interpretation of the plant disease epidemic, L. R. TEHON (*Phytopathology*, 16 (1926), No. 1, p. 63).—From a study of field data of certain plant diseases, correlated with temperature and rainfall, the author believes that climographs can be drawn, based on correlations between diseases and weather conditions, that will be of practical value in connection with predicting the occurrence of various diseases.

Report of the plant pathologist, C. M. TUCKER (*Porto Rico Sta. Rpt.* 1926, pp. 28-30).—Following the discovery and investigation of the coconut bud rot (*Phytophthora palmivora*) in Porto Rico (E. S. R., 55, p. 150), surveys were made to determine the distribution of the disease, and all infected trees were destroyed by burning. In the first survey, which was made in 1925, there were found 1,537 dead and infected trees on 127 properties. A second survey in April, 1926, revealed 94 new cases of disease on 19 new properties. A third survey in the summer of 1926 showed 15 new properties infected and 50 diseased trees.

Brief accounts are given of the hat palm (*Sabal caustiarum*) as a host of the fungus causing coconut bud rot (E. S. R., 57, p. 550), on scab resistance in grapefruit, a *Fusarium* disease of vanilla, and a leaf spot of pigeon peas caused by *Colletotrichum cajani*.

A wound dressing for plants, I. E. MELHUS (*Phytopathology*, 16 (1926), No. 1, p. 79).—A brief description is given of a wound dressing produced from furfural and creosol, which is reported to be valuable for dressing wounds of trees to protect against infection.

Ammonia injury of fruits and vegetables in storage, G. B. RAMSEY and L. F. BUTLER (*Phytopathology*, 16 (1926), No. 1, p. 73).—Observations in the Chicago market of brownish-black discolorations of fruits and vegetables, normal in every other respect, are reported. Discolored onions were found most frequently, but peaches, apples, pears, and bananas also showed a similar type of injury. No causal organism was found, which led to a study of storage conditions, and the same type of injury was duplicated in the laboratory with ammonia. The extent of injury was determined by the amount of ammonia in the air and the duration of the exposure.

Infection phenomena of *Alternaria*, *Diplodia*, and some other fungi, P. A. YOUNG (*Phytopathology*, 16 (1926), No. 1, p. 70).—The author reports that *D. zeae*, *Cephalosporium acremonium*, *Colletotrichum nigrum*, and many species of *Alternaria*, *Macrosporium*, and *Helminthosporium* induce infected wheat coleoptiles to form spherical or cylindrical, hyaline to brown bodies on and in the cell walls. The name callosities was proposed for these bodies, and their formation was found to be a typical reaction of plumules of wheat, oats, rye, barley, pop corn, sorghum, broomcorn, cabbage, radish, turnip, tomato, soy bean, wax bean, pumpkin, muskmelon, etc., to infection by *Alternaria* and *Macrosporium*.

Facultative parasitism of *Alternaria* and some other fungi, P. A. YOUNG (*Phytopathology*, 16 (1926), No. 1, p. 70).—*Helminthosporium gramineum* and many species of *Alternaria* and *Macrosporium* are said to be facultative parasites, with a wide experimental host range, but in nature the host range is decidedly limited. *H. gramineum* and three species of *Alternaria* were found to act like rust fungi in causing green spots in yellow leaves of wheat, rye, radish, and nightshade. It is thought probable that fungus enzymes stimulate formation or delay decomposition of chlorophyll in host cells near such leaf spots.

***Botryosphaeria* and *Physalospora* in the eastern United States,** C. L. SHEAR, N. E. STEVENS, and M. S. WILCOX (*Mycologia*, 17 (1925), No. 3, pp. 98–107, pl. 1).—*B. ribis* is here reported from 17 host species and *P. malorum* from 22 host species in the eastern United States. Pycnospores were produced in pure cultures from single ascospores. Throughout this host range both species showed remarkable uniformity in ascospore size, germination type, and cultural characters on different media. Pycnospores, whether produced in culture or on the host, also showed great uniformity. Sporocarp size in both species varied with the thickness and character of the host bark. The distinguishing characters of the two species remained constant for currant and apple. Ascospores of *B. ribis* were constantly smaller than those of *P. malorum*. Other differences are indicated.

Crown gall or plant cancer [trans. title], P. E. PINOY (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 4, pp. 311–313).—Among the observations made was that *Bacillus fluorescens* was present in tumors which appeared perfectly sound.

The life history and relationships of *Diplodia gossypina*, N. E. STEVENS (*Mycologia*, 17 (1925), No. 5, pp. 191–201, pl. 1).—It is thought that the perfect stage of *D. gossypina* is a *Physalospora* closely related to *P. malorum*. This perfect stage, provisionally called *P. gossypina*, is distinguished from *P. malorum* by having slightly larger perithecia and ascospores. The pycnospores of the two fungi are easily distinguished by size, color, and relative number of septate spores. *D. gossypina* can not be distinguished at present from *D. natalensis* on morphological grounds, but the latter is able to grow at higher temperatures.

Botryosphaeria fuliginosa includes species belonging to both *Botryosphaeria* and *Physalospora* as now understood.

The bioluminescence of *Omphalia flavida*, a leaf-spot fungus, A. H. R. BULLER and T. C. VANTERPOOL (*Phytopathology*, 16 (1926), No. 1, p. 63).—The authors report infection experiments with *O. flavida* on leaves of *Bryophyllum*, oleander, and *Ficus*, in which the leaf spots appeared faintly luminous in the dark.

The influence of carbon dioxide and oxygen on the growth of *Ophiobolus graminis* in pure culture, M. FELLOWS (*Phytopathology*, 16 (1926), No. 1, p. 81).—By varying the carbon dioxide and oxygen content of the atmosphere it

was found that *O. graminis* grew in oxygen contents varying from 0.2 to 21.3 per cent in both liquid and solid media. A variation in the carbon dioxide content between 0.9 and 18 per cent did not affect the growth of the fungus very greatly. It is believed that the variations in carbon dioxide and oxygen as found in arable soils are not great enough to affect materially the growth of *O. graminis*.

The effect of the alternate hosts on physiologic forms, S. M. DIERZ (*Phytopathology*, 16 (1926), No. 1, pp. 83, 84).—The effect of *Rhamnus* species on the fixity of physiologic forms of *Puccinia coronata* was studied to determine the possible influence of the alternate hosts on the infective capabilities of the aeciospores produced on them and the possibility of increasing their grass host range. It was found that aeciospores produced by various species of *Rhamnus* inoculated with teleutospores from grasses were able to infect oats and a number of other species of grasses.

Infection and spore germination studies with *Puccinia sorghi*, M. A. SMITH (*Phytopathology*, 16 (1926), No. 1, p. 69).—The common sorrel (*Oxalis corniculata*) was found to be heavily infected with *P. sorghi* in Iowa during 1925. The earliest infection was observed on April 28 and the latest on June 19. Normal acedial infection was obtained with teleutospores of *P. sorghi* on *O. corniculata*, *O. europea*, and *O. tropaeoloides*, while only pycnidial infection occurred on *O. valdiviensis*. No infection occurred on *O. cernua* or *O. rubra*. Tests of the germination of uredospores showed marked dependence on humidity, and germination in the open was found to diminish from September on, no uredospores germinating after April 15.

Silver-leaf disease [trans. title], G. NICOLAS (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 4, pp. 265-269).—It is regarded as probable, for reasons briefly stated, that silver-leaf on a number of plants listed may be occasioned by several causes, organic or physiological.

Changes in hydrogen-ion concentration induced by carbon dioxide in relation to the germination of spores of *Ustilago levis*, M. F. HOWE (*Phytopathology*, 16 (1926), No. 1, pp. 69, 70).—In attempting to determine the effect of fragments of living plant tissue on the increased germination of the spores of *U. levis*, the influence of carbon dioxide given off by the tissue on the H-ion concentration was studied. Spore suspensions made by placing spores in tap water in suitable dishes showed that the highest percentages of germination occurred at pH 4.9. A continuous flow of carbon dioxide caused the pH to vary from 6.7 to 4.9, a similar variation having been observed where the source of carbon dioxide was fragments of living plant tissue.

Spore suspensions confined in an atmosphere consisting of different percentages of carbon dioxide failed to produce the optimum of pH 4.9, but by a continuous flow of carbon dioxide into the spore suspensions this optimum was obtained, as well as a high percentage of germination comparable to that noted in cultures where fragments of plant tissues were present.

Culture experiments with heteroecious rusts in 1922, 1923, and 1924, W. P. FRASER (*Mycologia*, 17 (1925), No. 2, pp. 78-86).—Infection tests are outlined as made and studied with several rusts.

Factors determining sensitivity or resistance to cereal rusts [trans. title], E. FOEX (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 330-333).—A review, chiefly bibliographical, is given of phases and degrees of cereal resistance to rust in its mechanical, cellular, and physiological aspects.

Second report on dusting for cereal rusts, C. V. KIGHTLINGER and H. H. WHETZEL (*Phytopathology*, 16 (1926), No. 1, p. 64).—In continuation of a previous report (*E. S. R.*, 58, p. 144), the second season's experiments in dusting with sulfur for the control of rusts on wheat and oats showed that proper

applications of dusting sulfur will control these diseases to a significant degree. There was found to be some indication that excessive applications of sulfur dust may cause decreased yields in wheat.

The common barberry and black stem rust, E. C. STAKMAN, F. E. KEMPTON, and L. D. HUTTON (*U. S. Dept. Agr., Farmers' Bul. 1544* (1927), pp. II+29, figs. 14).—This is a popular description of the relation of the common barberry to the black stem rust of cereals, and supersedes a previous account (E. S. R., 41, p. 346).

Organic mercury compounds for the control of loose smuts of wheat and barley and barley stripe, I. L. CONNERS (*Phytopathology*, 16 (1926), No. 1, pp. 63, 64).—Uspulun, Germisan, and Semesan, at room temperatures, are said to have given practical control of stripe of barley caused by *Helminthosporium gramineum*, while the modified hot-water treatment failed to control the disease completely. Loose smuts of wheat and hull-less barley were not controlled by the mercury compounds.

Bacterial stripe blight of oats, C. ELLIOTT (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 9, pp. 811-824, figs. 3).—A description is given of a bacterial disease of oats collected in a number of localities in the oat-growing sections of the United States. The disease is characterized by the occurrence of water-soaked dots and streaks which later turn rusty brown. They are said to show no halo-like borders and under favorable conditions are covered with shining dried scales of exudate.

The organism causing this disease was compared with *Bacterium coronafaciens* (E. S. R., 43, p. 545), *B. coronafaciens atropurpureum* (E. S. R., 53, p. 849), and *Pseudomonas alboprecipitans* (E. S. R., 50, p. 349). On the basis of differences in the morphology and reactions of the different organisms the cause of the present disease is considered to be unlike those organisms mentioned above, and the name *B. striafaciens* n. sp. is suggested for it. A technical description of the organism is given.

Factors influencing development of wheat foot rot [trans. title], GAUDINEAU and L. GUYOT (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 4, pp. 317-342, pls. 4, fig. 1).—A detailed and systematic account of certain factors, among these weather and date of seeding, charges the severe attack of wheat foot rot that occurred in 1925 to climatic conditions during the previous winter. Early seedlings were most severely affected, but spring wheat did not escape injury. The use of disinfectants, as lime, sulfur, and iron sulfate, seemed to have some action on the development of foot rot.

The effect of tillage, fertilizers, and rotations on the spread of wheat foot-rot, L. E. MELCHERS and M. C. SEWELL (*Phytopathology*, 16 (1926), No. 1, p. 81).—In continuation of a previous report (E. S. R., 55, p. 846), two years' additional data are given on winter wheat tillage plats, which confirm the previous conclusion that shallow, late tillage checks the rapid spread of foot rot, while deep, early plowing favors its survival and spread. The application of fertilizers seemed to have little influence on the spread of foot rot during four years' observations.

Susceptibility of wheat varieties and selections to loose smut, F. D. FROMME (*Phytopathology*, 16 (1926), No. 1, pp. 86, 87).—Inoculation of florets of two varieties of wheat produced 62 per cent infected plants of Stoner and only 3 per cent of infected plants of the variety Leap. Thirty-five per cent of the Stoner heads were smutted as compared with 4 per cent of heads of Leap. Other wheat varieties tested were said to have shown marked differences in the incidence of loose smut, and each variety, with few exceptions, showed a high degree of uniformity when rated in terms of a standard.

Similar differences were found, but of greater degree, in pure lines of Fulcaster. Some were very susceptible, others moderately so, and still others were highly resistant. The most susceptible selection proved to be 8 times as susceptible as the Fulcaster parent, and the most resistant strain was 20 times as resistant as the parent variety.

Preliminary experiments on the control of leaf and stem rusts of wheat by sulphur dust, D. L. BAILEY and F. J. GREANEY (*Phytopathology*, 16 (1926), No. 1, p. 64).—Experiments with Marquis wheat in Winnipeg are said to have shown that 3 applications of sulfur per week at the rate of 15 lbs. per acre practically controlled both leaf and stem rusts, with an increased yield of 34 bu. per acre. In a series of experiments where grain was dusted with sulfur at the rate of 15 lbs. per acre when rain seemed imminent (7 applications being given), the percentage of infection and yield was about the same as in plots which received 2 applications per week, or a total of 17 applications.

Effect of sulfur dust on the development of black stem rust of wheat in a natural epidemic, E. B. LAMBERT and E. C. STAKMAN (*Phytopathology*, 16 (1926), No. 1, pp. 64, 65).—In 1925, wheat in Minnesota was dusted with precipitated sulfur at the rate of about 30 lbs. per acre to determine the effect on stem rust, and the results support previous statements by Kightlinger (E. S. R., 58, p. 144) that sulfur dusts control rusts under certain conditions. The time of application is considered a most critical factor. In some experiments, one application virtually controlled rust in spite of a heavy natural epidemic. In others, five applications were practically ineffective. It is believed that sulfur is not effective very long after its application and that it should be applied just before a spore shower. It was found not to inhibit the development of uredinia after plants were once infected.

The take-all disease in Canada, W. P. FRASER, P. M. SIMMONDS, and R. C. RUSSELL (*Phytopathology*, 16 (1926), No. 1, pp. 80, 81).—As a result of field surveys made during 1923–1925, take-all disease of wheat was found to cause considerable loss in a large number of spring wheat fields throughout the semi-wooded part of northeastern Saskatchewan. It was also found in north central Alberta, but was not observed in the prairie regions. Greenhouse studies with the Saskatchewan fungus showed that all members of the subspecies of *Triticum* tested were subject to attack. In addition to the susceptible grasses noted by Kirby (E. S. R., 53, p. 348), the authors found that *Avena hookeri*, *Bromus inermis*, *B. latiglumis*, *B. porteri*, *Agropyron dasystachyum*, and *Elymus innotatus* were attacked.

Control of brown-patch in turf, J. MONTEITH, JR. (*Phytopathology*, 16 (1926), No. 1, p. 76).—Two types of brown patch occurring on lawns and putting greens have been recognized, large brown spots which are generally limited to hot, humid weather, and small spots which may occur over a wide range of climatic conditions. It is claimed that large brown patch may be readily controlled by spraying or dusting with Bordeaux or other copper sprays. However, repeated applications of copper salts were found to produce an accumulation of toxin in the soil which may seriously injure the turf. Small brown patch was checked by neither organic nor inorganic copper sprays, but mercury compounds tested controlled both types of brown patch. Mercury salts were found to give protection for a period of a few days to several weeks, depending upon the amount applied, severity of disease attacks, soil, rainfall, etc. Formaldehyde, under certain conditions, was found to protect grass from the diseases for a few days, but its effect was not lasting. Sulfur did not check either type of disease and was toxic to grass.

Study of *Peronospora trifoliorum* on species of Leguminosae, M. K. PATEL (*Phytopathology*, 16 (1926), No. 1, p. 72).—The author states that on

account of the increased acreage of alfalfa, *P. trifolium* is assuming greater economic importance in the Middle West. The fungus was found to be limited to *Medicago sativa* and *M. lupulina*, although 31 species in 16 genera of leguminous plants were exposed to infection.

Infection in alfalfa, although usually local, may become systemic, involving parts of the shoots from the crown. The fungus is said to survive unfavorable growth periods by oospores produced sparingly in the leaves of alfalfa late in the fall. No positive data have been secured to indicate that the mycelium may live over in infected plants.

Bacterial wilt of beans (*Bacterium flaccumfaciens*), including comparisons with *Bacterium phaseoli*, F. HEDGES (*Phytopathology*, 16 (1926), No. 1, pp. 1-22, pls. 3, figs. 2).—A detailed account is given of studies of the bacterial wilt of beans caused by *B. flaccumfaciens*, (E. S. R., 47, p. 148), and comparisons are made between that organism and *B. phaseoli*, the cause of bean blight.

Studies upon the inheritance of *Fusarium*-resistance in cabbage, J. C. WALKER (*Phytopathology*, 16 (1926), No. 1, p. 87).—The author states that by selfing individual cabbage plants through three generations a line was established which was apparently homozygous for resistance to *F. conglutinans* under field conditions favorable for the development of the yellows disease. Similarly, through selfing and close pollination, individuals apparently homozygous for susceptibility under the same environment were selected from commercial varieties. The F₁ hybrids from several crosses between resistant and susceptible individuals were nearly all disease-free. The data presented are said to indicate that resistance to yellows, as expressed under field environment, is a dominant unit character.

A new *Fusarium* resistant cabbage, J. C. WALKER, J. MONTEITH, JR., and F. L. WELLMAN (*Phytopathology*, 16 (1926), No. 1, pp. 72, 73).—Selections from the variety Glory of Enkhuizen have been developed that are resistant to cabbage yellows. The stability in resistance has been shown in two successive generations on thoroughly infested soil in southeastern Wisconsin, as well as in trials in a number of other localities. Evidence was found that whenever individuals of this line were crossed with susceptible individuals the F₁ hybrids showed practically 100 per cent resistance in each case.

Development of three midseason varieties of cabbage resistant to yellows (*Fusarium conglutinans* Woll.), J. C. WALKER, J. MONTEITH, JR., and F. L. WELLMAN (*Jour. Agr. Research* [U. S.], 35 (1927), No. 9, pp. 785-809, figs. 5).—A detailed description is given of the methods pursued in the development of three varieties of cabbage which are resistant to yellows. All are midseason varieties, and in 1926 they gave satisfactory results when tested for disease resistance and horticultural value.

The new strains have been given varietal names. Globe was originated from the variety Glory of Enkhuizen, Marion Market from Copenhagen Market, and All Head Select from All Head Early. All varieties are being propagated for commercial use.

A yellows resistant strain of Copenhagen market cabbage, Iacope, F. VAN HALTERN and A. T. ERWIN (*Phytopathology*, 16 (1926), No. 1, p. 72).—The authors report that a strain of Copenhagen market cabbage (Iacope) has been isolated which in the field has proved consistently resistant, during three years, to the cabbage yellows disease (*Fusarium conglutinans*). The progeny of selfed, resistant strains proved equally as, or even more resistant than, the parent plants.

Club-root of Chinese cabbage, W. H. DAVIS (*Mycologia*, 17 (1925), No. 4, pp. 160-162, fig. 1).—From 1923 to 1924 there developed on Chinese cabbage (*Brassica pe-tsai*) at the Massachusetts Agricultural College root galls which were studied. It appears evident that various varieties of Chinese cabbage are hosts for *Plasmodiophora brassicae*, which causes the disease commonly known as clubroot.

Colletotrichum trifolii and Gloeosporium caulivorum on clover, J. MONTEITH, JR. (*Phytopathology*, 16 (1926), No. 1, pp. 71, 72).—Investigation of the two common clover anthracnose diseases is said to have shown that their distribution is largely dependent on temperature. In a laboratory experiment, the optimum temperature for growth of *C. trifolii* was found to be about 28° C., while that for *G. caulivorum* was about 20°. Under controlled conditions artificial inoculations indicated that this temperature relationship was also similar for infection. The two fungi are said to produce virtually the same disease symptoms on clover. *C. trifolii* was found to cause most damage during warm weather, and it was especially common in the Southern States, while *G. caulivorum* was usually found in northern sections or in the South during the cooler seasons. Some imported strains of red clover proved most susceptible to the disease, while certain American strains were resistant to both organisms.

Aspergillus decay of cotton bolls, M. SHAPOVALOV (*Phytopathology*, 16 (1926), No. 1, p. 75).—The author reports a decay of cotton bolls, due to *A. niger*, which is said to have been prevalent in some of the Southwestern States. A more detailed account of this disease has been given (E. S. R., 58, p. 242).

Cotton wilt studies, V. H. YOUNG (*Phytopathology*, 16 (1926), No. 1, p. 76).—Studies of strains of *Fusarium vasinfectum* from several States are said to have shown an appreciable difference in their pathogenicity for cotton, some of them being extremely pathogenic and others less so. Studies were made of the temperature relations of the organism, and the maximum soil temperature for cotton wilt infection was found to be higher than 35° C. (95° F.) and the minimum temperature near 25°.

The influence of temperature upon the metabolism and expression of disease resistance in selfed lines of corn, J. G. DICKSON and J. R. HOLBERT (*Phytopathology*, 16 (1926), No. 1, p. 82).—Disease resistant and susceptible strains of yellow dent corn were studied comparatively under controlled conditions, as well as under varying field conditions. The resistant strains are said to remain healthy over a much wider range of temperature than open-pollinated material or the susceptible strains. The metabolism of the resistant, selfed strains, although similar to that occurring in the open-pollinated corn, was more stable over a greater range of temperature. The metabolism of the susceptible, selfed strains did not correspond to that of either the resistant strains or open-pollinated corn. The susceptible strains studied were different in composition and in relative ratio of substances present at all temperatures. In general, the pentosan substances were found to increase with the rise in temperature rather than decrease as in the resistant strains.

A Pythium seedling blight and root rot of dent corn, H. JOHANN, J. R. HOLBERT, and J. G. DICKSON (*Phytopathology*, 16 (1926), No. 1, p. 85).—The authors report an undetermined species of *Pythium* that was found associated with root rots of dent corn in Illinois and Wisconsin. Infection was said to occur usually at the tips of rootlets, producing soft rot and first involving the cortex and later the vascular elements. Soil temperatures of from 12 to 16° C., with high soil moistures, were found to favor blighting, which prevented germination. Some seedlings blighted above 16°. If the infection was not severe

enough to kill the seedlings, growth and vigor were retarded. Field inoculations confirmed the laboratory studies.

Sclerospora graminicola on corn, I. E. MELHUS and F. VAN HALTERN (*Phytopathology*, 16 (1926), No. 1, pp. 85, 86).—The authors report that the oospores of *S. graminicola* on *Setaria viridis* may cause seedling infection of corn, teosinte, sorghum, and millet.

Seed treatments for the control of certain diseases of dent corn, J. R. HOLBERT, C. S. REDDY, and B. KOEHLER (*Phytopathology*, 16 (1926), No. 1, pp. 82, 83).—Extensive experiments carried on in various places in Illinois during a 5-year period are said to have shown that dent corn grown from seed infected with *Diplodia zeae* and *Gibberella saubinetii* was greatly improved both in yield and quality by seed treatment with various fungicides, while corn from *Fusarium moniliforme* infected and scutellum-rotted seed was not improved. Treated infected seed did not yield as well as untreated, nearly disease-free seed, but seed treatment is considered desirable when it is impossible to secure nearly disease-free seed.

Sweet corn seed treatment in 1925, C. S. REDDY, J. R. HOLBERT, and A. T. ERWIN (*Phytopathology*, 16 (1926), No. 1, p. 65).—A report is given of experiments carried on in Illinois and Iowa in which sweet corn seed was soaked or dusted with several proprietary germicides and the effect on yield of corn prime for canning was determined. In all cases increased yields were secured where diseased seed was treated. With nearly disease-free seed a reduction in yield followed in most instances.

The cottony leak of eggplant fruit caused by *Pythium aphanidermatum*, C. DRECHSLER (*Phytopathology*, 16 (1926), No. 1, pp. 47-50, pl. 1).—The author briefly describes a disease of eggplant fruit caused by *P. aphanidermatum*, which has previously been reported to cause a similar disease of the cucumber (E. S. R., 53, p. 851).

Inheritance of immunity from *Melampsora lini*, A. W. HENRY (*Phytopathology*, 16 (1926), No. 1, p. 87).—A brief report is given of the reaction to *M. lini* of crosses made between immune and susceptible varieties of flax.

Downy mildew (*Sclerospora graminicola*) on the Everglade millet (*Chaetochloa magna*), W. H. WESTON, JR., and G. F. WEBER (*Phytopathology*, 16 (1926), No. 1, p. 71).—The authors report that the causal fungus of downy mildew of Everglade millet appears to be *S. graminicola*. The fungus was collected on this plant, growing wild in the Everglades of southeastern Florida, but no other host has been found. In many respects the behavior of the fungus is similar to that described on *C. viridis* in the Northern States, but this is the first time that this species of *Sclerospora* has been found in the Southern States or on this host in any locality.

Fusaria causing bulb-rot of onions, G. K. K. LINK and A. A. BAILEY (*Phytopathology*, 16 (1926), No. 1, pp. 74, 75).—In a study of species of *Fusarium* which cause bulb rot of onions several hundred isolations were made, but the pathogenicity of all of them was not tested. Among the species which were found invariably pathogenic were *F. zonatum* form 1, *F. zonatum* form 2, and *F. cepae*, all of which belong to the section *Elegans*. *F. moniliforme* was isolated from decaying bulbs but was not found invariably pathogenic. Some of the species were found associated with bacteria, which cause a decay unlike the typical bulb rot produced by the pathogenic species. Among those so identified are *F. oxysporum*, *F. vasinfectum*, *F. bulbigenum*, and *F. martii minus*.

Nuclear phenomena and life history of *Urocystis cepulae*, A. W. BLIZZARD (*Phytopathology*, 16 (1926) No. 1, p. 69).—A brief account is given of the development of various stages of the onion smut fungus.

A wilt disease of peas in Wisconsin, M. B. LINFORD (*Phytopathology*, 16 (1926), No. 1, p. 75).—A report is given of a wilt disease of canning peas which is said to have caused losses in Wisconsin during 1924 and 1925 second only to those caused by root rot due to *Aphanomyces*. This disease is said to be characterized by early and rapid wilting of leaves with or without previous yellowing, and without decay or lesions of the cortex of roots or basal stem. It was found most frequently destructive in fields which had been heavily cropped with peas.

Isolation of fungi from wilted plants showed three groups of *Fusarium*, which are tentatively considered as undetermined species. From one of the groups of cultures 75 proved pathogenic.

Potato disease [trans. title], T. CARRASQUILLA (*Colombia Min. Indus., Seco. Pubs., Bol. Propag. Agr., No. 1* (1927), pp. 47, figs. 5).—A somewhat detailed general account is given of potato blight. (*Phytophthora infestans*), known locally in Colombia as gota or mancha.

The "black dot" disease of potato, B. T. DICKSON (*Phytopathology*, 16 (1926), No. 1, pp. 23-40, pl. 1, figs. 4).—Black dot, anthracnose, or foot rot of potatoes, a disease caused by *Colletotrichum atramentarium*, is described. The disease is said to be widely distributed in this country, as well as in Europe. The fungus is considered to be a weak parasite, attacking mainly debilitated plants or young plants which succumb in early maturity.

Colletotrichum v. Vermicularia, B. T. DICKSON (*Mycologia*, 17 (1925), No. 5, pp. 213-217, pl. 1).—During a study of potato black dot the author examined dried specimens of various species of *Vermicularia* on potato, as a result of which he raises the question as to the validity of the determinations. It is considered apparent that the genus *Vermicularia* needs thorough monographic study. An account is given of a study of *V. maculans*, *V. atramentaria*, *V. minuta*, and *V. orthospora*.

Spindle-tuber disease, J. A. HOLDEN (*U. S. Dept. Agr. Circ. 5* (1927), pp. 27, 28).—A report is given of an experiment conducted at Scotts Bluff, Nebr., in cooperation with the Nebraska Experiment Station to determine whether the spindle-tuber disease of potatoes is carried by irrigation water. Plots were so arranged that all water used for irrigation purposes was passed through rows planted with diseased tubers to other rows planted with certified seed tubers.

The results of the experiment show that while the spindle-tuber disease spreads across at least three rows, it is not carried from diseased plants to healthy plants down the row by irrigation water.

Observations on the stem rot of rice caused by *Sclerotium oryzae*, V. H. YOUNG (*Phytopathology*, 16 (1926), No. 1, p. 86).—The stem rot of rice caused by *S. oryzae* is briefly described. Further accounts of the study of this disease have been noted (*El. S. R.*, 55, p. 42; 56, p. 347).

Modes of infection of sorghums by loose kernel smut, J. A. FARIS and G. M. REED (*Mycologia*, 17 (1925), No. 2, pp. 51-67, pls. 3).—Several modes of entrance of cereal smuts into their respective hosts are described, in particular a new mode of infection of sorghum by *Sphacelotheca cruenta*.

Resistance in sugar beets to curly-top, E. CARSONER (*Phytopathology*, 16 (1926), No. 1, pp. 87, 88).—A large number of strains of sugar beets selected for their apparent resistance to curly top were subjected to a rigorous test in a locality infested by the leafhopper (*Eutettia tenella*). The results obtained showed that some were more susceptible than the controls, while others were less affected.

The results of this investigation are believed to show that there are marked variations in resistance to curly top among sugar beets, and they seem to justify the belief that a resistant commercial strain can be developed.

Studies on *Helminthosporium sacchari* on sugar cane in Porto Rico, M. T. COOK (*Phytopathology*, 16 (1926), No. 1, p. 71).—A destructive outbreak of this fungus was reported in Porto Rico in 1923 and again in 1925. The development of the disease is said to be influenced by temperature and moisture. It is reported to be exceptionally destructive to young plants, killing great numbers of them in some of the varieties.

Sweet potato mosaic and its incubation period of two growing seasons, H. R. ROSEN (*Phytopathology*, 16 (1926), No. 1, p. 74).—In a preliminary report on this disease (E. S. R., 44, p. 345) the author called attention to its noncommunicability. This claim has been confirmed by further studies, as well as by the investigations carried on by others. Experiments made by the author have indicated a remarkably long incubation period, even under optimum conditions, no symptoms appearing in less than two consecutive growing seasons. There is said to be a gradual increase in the severity of the disease in the progeny of inoculated plants, although sometimes the symptoms are pronounced when the disease first appears.

Further evidence of the non-transmissibility of the so-called sweet potato mosaic, J. L. WELMER (*Phytopathology*, 16 (1926), No. 1, p. 74).—The author reports that Nancy Hall sweet potatoes from vines showing symptoms of mosaic were carried through three generations under different environmental conditions, the mosaic symptoms being evident to about the same degree on each. Healthy plants, with vines growing intermingled with those of diseased plants, gave no evidence of disease even in the second generation. Unsuccessful efforts were made to transmit the disease by the usual mechanical means, grafting, etc. Grafts, following a good growth in the greenhouse, were set in the field, and the healthy vines, after growing on diseased roots for eight months, were still healthy, while diseased vines on healthy roots remained diseased. A small crop of potatoes was produced by all the plants, and whenever they were sprouted before being dug the young plants were diseased if attached to a diseased root and healthy if from a healthy root.

Control of field tobacco mildew in the Vorstenlanden [trans. title], A. D'ANGREMOND (*Proefsta. Vorstenland. Tabak* [Dutch East Indies], Meded. 56 [1926], pp. 48, pl. 1, figs. 2; Eng. abs., pp. 46, 47).—Recent experimentation in dusting the soil with finely powdered sulfur has proved effective against tobacco mildew (*oidium* sp.) when applied over a large area.

A mycetozoan found in tobacco plants with mosaic-like symptoms, P. M. JONES (*Phytopathology*, 16 (1926), No. 1, p. 67).—An intracellular mycetozoan, *Plasmodiophora tabacum* n. sp., is reported in tobacco plants. Similar organisms are said to occur in potato plants affected with either mosaic or leaf roll, and in tomato plants affected with mosaic.

New virus disease of tobacco and related plants, J. JOHNSON (*Phytopathology*, 16 (1926), No. 1, p. 66).—The author enumerates a number of virus diseases of tobacco, and it is claimed that these viruses are specific as indicated by symptomatology, differential host range, and properties. Certain combinations of these viruses are said to produce different sets of symptoms, and, in general, they appeared to be more malignant than when each virus acted alone. No evidence had been secured to show that the viruses could be modified fundamentally by passage through differential hosts.

The dilution method as a means for making certain quantitative studies of viruses, H. H. MCKINNEY and R. W. WEBB (*Phytopathology*, 16 (1926), No. 1, p. 66).—By inoculating plants with diluted virus from a mosaic plant resulting from inoculations with highly diluted virus, mosaic was obtained in the eighth experiment in practically undiminished amounts from virus which had passed through 8 plants and which had been diluted in water equivalent to 10^{-38} .

A single water dilution of this magnitude being too great to produce mosaic, it is considered evident that the quantity of virus must have increased in the plants.

Inhibition of mosaic infection, O. H. ELMER (*Phytopathology*, 16 (1926), No. 1, pp. 67, 68).—The author claims that diluting the juice from mosaic tobacco with juice from healthy plants causes an inhibitory effect on the mosaic virus. Experiments with juices from beans, cucumbers, and tobacco plants showed marked inhibitions on mosaic virus, but this effect was not permanent.

The destruction of the chloroplasts in tomato mosaic, H. SOROKIN (*Phytopathology*, 16 (1926), No. 1, pp. 66, 67).—The author states that in the green areas of living tomato leaves affected with mosaic many of the chloroplasts are still normal, but as the disease progresses the chloroplasts disintegrate. In the early stages there are said to appear inside the chloroplasts refractive, crystal-like bodies which may be either stationary or actively motile. Later a blister-like swelling, which gradually increases in size, appears on one side of the chloroplast, the chloroplast becoming smaller as the blister-like sphere increases in size. Finally the chloroplast disappears entirely, and one or several of the crystal-like bodies can be seen inside the spheres, where they are practically always actively motile. These are said to be especially abundant in the chlorotic areas of mosaic tissues and are easily destroyed by certain chemicals. Whether these two types of bodies are causal or incidental has not been determined, but they are said to be constantly associated with the destruction of the chloroplasts.

Chemical injury to watermelons in transit, W. W. GILBERT and F. C. MUELLER (*Phytopathology*, 16 (1926), No. 1, p. 73).—Injury to watermelons caused by contact with chemicals, including fertilizer materials in freight cars, has been frequently reported. Experiments conducted to determine whether any chemicals carried as freight might damage melons indicated that after five days melons under pressure showed marked injury, such as discoloration, pitting, and softening, when in direct contact with acid phosphate, potassium muriate, common salt, and sodium nitrate. Some damage resulted under the same conditions from ammonium sulfate and potassium sulfate. Neither hydrated lime nor air-slaked lime caused any injury.

Migration and transformation of *Bacillus amylovorus* in apple tissue, E. L. NIXON (*Phytopathology*, 16 (1926), No. 1, p. 77).—A brief account is given of investigations on the migration of the fire blight organism, its overwintering, etc., a more detailed account of which has already been noted (E. S. R., 55, p. 549).

The variability in the black rot fungus of the apple, J. S. COOLEY and E. A. FENNER (*Phytopathology*, 16 (1926), No. 1, pp. 41-46, fig. 1).—The results are given of a study of *Physalospora malorum* made to determine the existence of strains of the organism. Isolations were made from rotting apples in 14 different localities in the United States and Canada, and about 6,800 inoculations were made. In many cases the cultures of the black rot fungus from the same locality exhibited a wide variation in the size of the rot produced in a given time when inoculated into the apple. In some groups the average diameter of the largest rot was more than twice that of the smallest. As much variation was found within a group from a certain locality as there was between the groups from different localities.

Botryosphaeria ribis* and *B. ribis chromogena, isolated from rots resembling the black rot, when inoculated into the apple produced a similar rot. Both forms of the fungus exhibited a variation in pathogenicity similar to that of *Physalospora*. The authors state that the rots produced by *Physalospora* and by the two forms of *Botryosphaeria* were indistinguishable.

Hairy root of apple seedlings, J. H. MUNCIE (*Phytopathology*, 16 (1926), No. 1, p. 78).—Three types of hairy root are said to have been observed on French apple seedlings, the woolly knot form, arising from a distinct gall; the simple form; and the type in which fine fibrous roots arise in clusters from the taproot. The first type is claimed to be infectious, and was induced by artificial inoculation of healthy seedlings with *Bacterium tumefaciens*. The second type was the least common, while the third type was the most abundant. Repeated attempts to isolate *B. tumefaciens* from the last type were unsuccessful. The last two types on seedlings are believed to be nonpathogenic forms of hairy root.

Studies on the development of the ascigerous stage of *Venturia inaequalis* in nature, G. W. KERR and E. E. WILSON (*Phytopathology*, 16 (1926), No. 1, p. 77).—On account of the conditions affecting the abundance of ascospores and the time of their maturity and discharge as regards the development of epidemics of apple scab, studies were made of the development of the fungus from a time prior to leaf fall until the ascospores were matured and discharged. Under the conditions of the experiment, ascospores were found to mature much earlier in leaves which fell in early autumn than in those which remained on the tree until late autumn or early winter. Temperature and moisture were found to be factors of importance in determining the rate of development of the ascocarps. Promising results were obtained in spraying infected leaves with various chemicals shortly before leaf fall.

Studies of apple scab infection under controlled conditions, G. W. KERR (*Phytopathology*, 16 (1926), No. 1, p. 77).—Experiments on scab infection in an inoculation chamber showed that the minimum temperature for infection is not more than 6° C. and the maximum not less than 26°. The optimum temperature was about 20°, which closely agreed with the optimum temperature for germination of ascospores and growth of the fungus (*Venturia inaequalis*). When inoculated plants were held at constant temperatures, the minimum periods of incubation varied from 17 days at 8° to 8 days at 20°. The minimum time required for continuous wetting which yielded leaf infection by ascospores was 6°, 18 hours; 9°, 13; 15°, 8.5; 20°, 6; and 26°, 10 hours.

The effect of crown gall on young apple and peach trees and longevity of *Bacterium tumefaciens* in the soil, J. H. MUNCIE (*Phytopathology*, 16 (1926), No. 1, p. 79).—Studies were made on water conduction in galled and normal piece-root grafted apple trees and budded 2-year-old peach trees. In 206 isolations from 84 galled apple trees, *B. tumefaciens* was recovered in 4 cases. In 200 apple trees examined by means of longitudinal sections through the middle of the union, 81 per cent of the healthy trees showed a perfect union of stock and scion, while 63 per cent of the galled trees showed only partial continuity. The reduction in water flow through galled trees of Wealthy, Salome, and Jonathan was 69.7, 21.7, and 47.2 per cent, respectively. In peach trees the average reduction in water flow through the galled trees was 82.4 per cent.

Young tomato plants set in soil infested with *B. tumefaciens* showed that typical crown gall resulted up to 102 days after infesting the soil.

Overwintering of *Bacterium pruni*, H. W. ANDERSON (*Phytopathology*, 16 (1926), No. 1, pp. 55-57).—The methods of overwintering of *B. pruni* have been studied over a period of five years, and while other investigators have shown that the bacteria are capable of overwintering in cankers, all evidence from the author's study of commercial peach orchards in Illinois is said to indicate that this is not the common source of initial infection. Bacteria were isolated from dead leaves in the spring, and it was believed that these bacteria might be responsible in some cases for the initial infection. Just how the inoculation is

brought about is unknown, but it is assumed that the bacteria are blown as dust particles or in fragments of leaves to the new foliage and, when moistened, readily cause infection.

Control of bacterial spot of peach with sodium silicofluoride, H. W. ANDERSON (*Phytopathology*, 16 (1926), No. 1, pp. 79, 80).—An account is given of experiments on peach for the control of the bacterial spot during 1925 at the Illinois Experiment Station. A more detailed account of these investigations has been noted (E. S. R., 57, p. 752).

Aerial galls of quince, J. A. McCLINTOCK (*Phytopathology*, 16 (1926), No. 1, p. 78).—In connection with crown gall studies in Tennessee, the author observed two old quince trees which showed numerous well developed aerial galls. A repeated examination of cuttings made from the trees showed no additional gall development, but in all cases where roots did develop on the galled cuttings they grew out from the galls. This is believed to indicate that the aerial galls on the old quince trees are not crown galls, but that they are similar to the burr-knots of apple and quince described by Swingle (E. S. R., 55, p. 754).

Coryneum ruborum Oud. and its ascogenous stage, S. M. ZELLER (*Mycologia*, 17 (1925), No. 1, pp. 33–41, pl. 1, fig. 1).—A description is given of the characters of lesions on canes of red and of black raspberries caused by *C. ruborum*, with an account of the technique involved in obtaining pure cultures of this organism from ascospores of the perfect stage, *Ascospora ruborum*.

Observations on masking of raspberry mosaic by high temperature, R. B. WILCOX (*Phytopathology*, 16 (1926), No. 1, p. 80).—According to the author certain types of raspberry mosaic are masked during hot weather. Mottled leaves formed during cool weather were found to retain their mottling, but new leaves developed during hot weather appeared normal. One species, *Rubus inominatus*, infected with a type of transmissible mosaic, was found to be not only peculiarly sensitive to temperature changes, but recorded these changes by very conspicuous leaf markings.

Grapevine excoriose [trans. title], L. RAVAZ and G. VERGE (*Compt. Rend. Acad. Sci. [Paris]*, 180 (1925), No. 4, pp. 313–315).—Principally on levels, grapevines in the Department of Hérault, Gard, and Aude are subject to attack by a darkening progressive disease. This is said to be associated with the presence of *Phoma flaccida*, which has been shown by inoculation tests to cause similar alterations.

The improvement of quality in figs, R. E. SMITH and H. N. HANSEN (*California Sta. Circ.* 311 (1927), pp. 23, figs. 16).—One of the serious problems of fig production in California is said to be due to diseases, of which endosepsis (brown rot or internal rot), souring, smut, and mold are the most common. Each of these diseases is briefly described, and as all of them are carried by insects the control of these agents is considered necessary.

Among the practical directions given for improving the quality of figs it is recommended that all unnecessary caprifig trees be destroyed. Rotten fruit, old dried fruit, and similar material near the fig orchard should also be properly disposed of and the ground beneath the trees kept clean and dry during harvesting time. It is suggested that figs should be picked up frequently, every day if possible, and they should be permitted to dry as much as possible before dropping. All diseased figs should be gathered and destroyed. The authors recommend that figs should not be dipped, washed, or wet unless required by the packer.

Preliminary notes on avocado fruit decay, W. T. HORNE (*Phytopathology*, 16 (1926), No. 1, p. 80).—A wound decay of ripe fruit of avocado, due to

Rhizopus nigricans; a dark decay, sometimes accompanied by the destruction of the seed, caused by *Diplodia natalensis*; fruit decays, caused by *Colletotrichum gloeosporioides* and *Pestalozzia* sp.; as well as decays due to *Alternaria*, *Cladosporium*, *Fusarium*, etc., are reported.

A citrus bacteriosis occurring in South Australia, H. K. LEWCOCK (*Phytopathology*, 16 (1926), No. 1, p. 80).—The occurrence of bacterial disease of citrus fruits, due to *Pseudomonas citriputeale*, was reported in South Australia and Victoria, in some instances losses amounting to from 30 to 40 per cent of the crop being recorded.

Anthraxnose or black spot, B. JOHNS (*So. African Fruit Grower and Smallhold.*, 13 (1926), No. 6, p. 165, fig. 1).—Anthraxnose of oranges is said to be common in the Transvaal. Loss is caused by spotting the fruit and lowering its keeping quality. Anthraxnosed fruits are readily attacked by blue mold, and this constitutes a menace to shipping interests. In certain districts anthraxnose may be found on the green fruit, spreading rapidly when it is ripe, even from tree to tree.

Experimentation referred to has shown that spore germination may be prevented by the use of Bordeaux mixture at the rate of 6 lbs. copper sulfate with 3.5 lbs. of lime to 100 gal. of water.

Incubation period of aster yellows in its insect host, I. O. KUNKEL (*Phytopathology*, 16 (1926), No. 1, p. 67).—Experiments are said to indicate that the virus of aster yellows passes through an incubation period in its insect host, *Cicadula scirpota*, the length of the incubation period varying somewhat in different experiments. In the case of the nymphs, a period of 2 weeks or more was found usually to elapse before nonviruliferous insects exposed to a diseased plant were able to transmit yellows to healthy plants. The incubation period is said to be somewhat shorter in adult insects, where it usually lasts from 6 to 10 days. Viruliferous insects apparently never lose their ability to transmit yellows.

An *Entyloma* parasitic on dahlia [trans. title], MR. and MRS. G. ARNAUD (*Rev. Path. Vég. et Ent. Agr.*, 12 (1925), No. 4, pp. 263, 264).—In Paris, dahlia is attacked by an *Entyloma* said to be typical of the genus but doubtful as to species.

Foot-rot of *Lilium candidum* and *Lilium pyrenaicum* caused by *Phytophthora cactorum*, C. DRECHSLER (*Phytopathology*, 16 (1926), No. 1, pp. 51-53).—A disease of the two mentioned species of lilies caused by *P. cactorum* is described. The disease is simply characterized by the rather sudden falling over of the aboveground parts of the plant, with the absence of any preliminary symptoms in the leaves or any other aboveground parts.

Brown canker of roses, A. E. JENKINS (*Mycologia*, 17 (1925), No. 2, pp. 87, 88).—A serious outbreak of rose brown canker was observed among the outdoor roses at the New York Botanical Garden. The effects are described.

Walnut rot [trans. title], M. GARD (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend.*, 49 (1925), pp. 382, 383).—The author describes walnut rot, which he has noted previously (*E. S. R.*, 57, p. 551; 58, p. 251).

Preliminary survey of *Hypoxyton* poplar canker in Oxford County, Maine, E. J. SCHREINER (*Mycologia*, 17 (1925), No. 5, pp. 218-220).—Cankers on older poplar trees in forest stands due to *H. pruinatum* are found mostly in the upper parts of the trees; on younger trees near the base. Infection ranged to 21 per cent in the open, but not quite so high in the forest stand. No cankers were found on *Populus tacamahacca*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A synopsis of the general morphology of animals, E. G. CONKLIN (*Princeton: Princeton Univ. Press, 1927, pp. VIII+85, figs. 29*).—The first part of this work deals with taxonomy (pp. 1-4), the second part with the principles of morphology (pp. 4-12), and the third part with the morphology of metazoa (pp. 12-85). A table on the morphology of animals is given as an insert.

Ferrets and ferreting, W. D. DRURY (*London: Bazaar, Exchange & Mart Ltd., [1927?], 6. ed., rev. and enl., pp. [4]+59, pls. 2, figs. 15*).—This is a practical manual on the breeding, managing, training, and working of ferrets. Chapters on working ferrets for shooting and hints on shooting to ferrets, by A. Niblett, are added in this edition.

A practical handbook on rat destruction, C. L. CLAREMONT (*London: John Hart, 1926, pp. [6]+180, pls. 6, figs. 2*).—This is a practical account.

Our migrant shorebirds in southern South America, A. WETMORE (*U. S. Dept. Agr., Tech. Bul. 26 (1927), pp. 24, figs. 6*).—This is an account of studies made by the author, a more extended report of which has been noted (*E. S. R.*, 54, p. 752). It deals with the present status in southern South America of the snipes, sandpipers, and plovers that migrate in winter from North America to points south of the Equator. The subject is presented under the headings of extent of investigations; migration of shorebirds from North America; present abundance of our migrant shorebirds; list of species; changes incident to colonization by man; present hunting of shorebirds; present protective legislation in Argentina, Uruguay, Paraguay, and Chile; sale of game and other birds; and future of North American shorebirds.

Bird banding, the telltale of migratory flight: A modern method of learning the flight-ways and habits of birds, E. W. NELSON (*Natl. Geogr. Mag.*, 53 (1928), No. 1, pp. 91-131, figs. 45).—This is a popular account by a former chief of the U. S. D. A. Bureau of Biological Survey.

Surinam toad, D. W. MAY (*Porto Rico Sta. Rpt. 1926, pp. 5, 6, fig. 1*).—Specimens of the giant toad, *Bufo marinus*, introduced into Porto Rico from Barbados in 1920 and liberated at the station, have increased so rapidly that they are now found in great numbers in the western end of the island and are being shipped for liberation in other parts of the island. The depredations of the changa and white grubs appear to have been lessened due to the activities of the toad. A list is given of numerous insects and related pests found to serve as food for the toad.

The cestodes of mammals, F. J. MEGGITT (*London [Jena: Frommann], 1924, pp. [3]+282*).—This has been prepared by the author as a means for determining the genus to which any cestode belongs and to provide references to the literature on the mammalian forms. Following an outline of the classification, descriptions are given of the genera, with a brief diagnosis of and keys for the separation of the genera, and with an indication of the type species. This is followed by a list of the larval forms, a key for identification of the genera to which they belong, references to the descriptions, a host list, an index, and a bibliography of 22 pages.

On Legerella hydropori n. sp., a coccidian parasite of the Malpighian tubules of Hydroporus palustris L. (Coleoptera), M. VINCENT (*Parasitology, 19 (1927), No. 4, pp. 394-400, pl. 1, figs. 2*).—The coccidian here described as new differs from the four other species of the genus described, in the number and size of the merozoites, and in the size of the cysts and the number of sporozoites. The infection of the small dytiscid beetle *H. palustris* with this new parasite is confined to the Malpighian tubules and is often very intense, heavily infested beetles being readily recognized on dissection.

Common names of insects approved for general use by American Association of Economic Entomologists (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 837-839).—This is a list of 42 additional common names of insects approved by the American Association of Economic Entomologists.

On a hibernating cage for insects, H. PRELL (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 830-834, fig. 1).—A description of a cage used by the author in Tharandt, Saxony, Germany.

On the specificity of acquired immunity in insects [trans. title], V. CHORINE (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 32, pp. 1395-1397).—This is a report of immunity experiments on the caterpillar of the wax moth in which a number of microbes were employed. It was found that the acquired immunity in this caterpillar is far from being specific, at least during the first 12 days.

The natural or biological control of insect pests [trans. title], G. RUSSO (*Lab. Ent. Estac. Nac. Agron. y Col. Agr. [Dominican Repub.] Bol.* 1 (1927), pp. 15).—This is a brief discussion of the natural control of insects.

Is glutathione the arsenic receptor in insects? D. E. FINK (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 794-801, figs. 3).—This is a more extended account of studies conducted and previously noted (E. S. R., 57, p. 57). The paper deals with the quantitative estimation of glutathione in normal insects and others that had been subjected to treatment with arsenicals of varying dilutions. The latter gave a marked reduction in their glutathione content, presumably indicating that glutathione is an arsenical receptor.

The fumigation of tomato houses with hydrocyanic acid gas, E. R. SPEYER and O. OWEN (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 144-147).—The experiments reported indicated that a mixture of 0.75 oz. of sodium bicarbonate and 0.25 oz. of sodium cyanide per 1,000 cu. ft. gives the best results, and that these amounts need not be varied in accordance with the degree of softness of growth of plants or the leakiness or tightness of houses.

[Codling moth and aphid control in Idaho] (*Idaho State Hort. Assoc. Proc.*, 32 (1927), pp. 53-63, 71-76, 77-85, 100-116).—The papers relating to the control of these important enemies of the apple include the following: The Arsenate of Lead Situation, by J. W. Hebert (pp. 53-59); Arsenical Spray Residue Situation in Idaho, by A. W. B. Kjosness (pp. 59-63); A Discussion of the Arsenical Spray Residue Problem, by A. W. Hansen (pp. 71-76); Removal of Spray Residue from Apples and Pears, by J. R. Magness (pp. 77-85); Aphids and Aphids, by C. Wakeland (pp. 100-108); and Trap Baits as a Supplementary Measure for Codling Moth Control, by M. A. Yothers (pp. 109-116).

Tenth biennial report of the Kansas Entomological Commission for the years 1925-1926 (*Kans. Ent. Comn. Bcn. Rpt.*, 10 (1925-26), pp. 37, pls. 3, figs. 2).—This report contains the following contributions: The Entomological Commission at Work in Southern Kansas, by E. P. Breakey (pp. 6-18); Report of Orchard Inspection Work in the North Half of Kansas, July 1, 1925, to July 1, 1926 (pp. 18-25), and Report of Orchard Inspection Work in the North Half of Kansas, July 1, 1926, to October 15, 1926 (pp. 25-29), both by L. M. Gates; Some Insects Injurious to Nursery Stock in the Nursery Row, by G. A. Dean (pp. 29-34); and Report of State Apiarist, 1925-1926, by R. L. Parker (pp. 34-37).

The insect and other invertebrate fauna of arable land at Rothamsted, Part II, H. M. MORRIS (*Ann. Appl. Biol.*, 14 (1927), No. 4, pp. 442-464, figs. 3).—This is a second contribution on the subject (E. S. R., 48, p. 457) from the Rothamsted Experimental Station.

Observations of the insects attacking cultivated plants in southeast Poland in the years 1921-1925 [trans. title], A. KRASUCKI (*Rocz. Nauk Rolnicz. i Leśnych*, 18 (1927), No. 1, pp. 127-130).—The attacks of the more important pests, particularly insects, are noted.

The European earwig, G. WILSON (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 8, pp. 468, 469).—A practical account of this pest, the California infestation of which is limited to an area in West Berkeley, several small outlying spots in Berkeley, and one in Oakland.

Locustidae as coconut pests in the Dutch East Indies and their parasites [trans. title], S. LEEFMANS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten*, No. 72 (1927), pp. V+95, pls. 15; *Eng. abs.*, pp. 85-90).—This report of studies deals particularly with the large locustids of the genus *Sexava* which cause severe damage in coconut plantations on the Talaut (Talaud) Islands.

Two species of thrips injurious to apples in the Pacific Northwest, L. CHILDS (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 805-808, pl. 1).—This contribution from the Oregon Experiment Station reports upon *Frankliniella occidentalis* and *Aeolothrips fasciatus*, the egg-laying punctures of which cause so-called pansy spot on apples. The development of these spots about the egg punctures resulted in some instances in lowering the grade of the fruit fully 20 per cent. Sprays of oil and Black Leaf 40 applied while the trees were in full bloom showed that injury can be materially reduced, but that these sprays do not give complete control.

Eurygaster integriceps and its injury in Syria and in Persia (*Le "Soudé" ou "Sen" (Eurygaster integriceps) et Ses Dégâts en Syrie et en Perse. Conférence Internationale du Blé, Rome, 1927. Rome: Inst. Internatl. Agr.*, 1927, pp. 46, figs. 2).—The first part of this account of the plant bug *E. integriceps*, by E. Achard, deals with observations of it in Syria (pp. 1-35). A report of observations of its injury to winter cereals in 1924 and 1925 is followed by an account of a campaign conducted against it in 1926. The second part, by A. H. Adle, deals with the pest in Persia (pp. 36-46).

The status of the pest in Transcaucasia and Transcaspiia has been noted by Vasil'ev, (*E. S. R.*, 31, p. 59).

Calcium arsenate as a cause of aphid infestation, J. W. FOLSOM (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 840-843).—The author reports upon investigations conducted with a view to determining why excessive applications of calcium arsenate are often followed by heavy infestations of the cotton aphid. It is concluded that the initial infestations are due to the positive phototropic reaction of winged females to white substances such as calcium arsenate, calcium carbonate, starch, or flour. A heavy infestation is built up, not by the destruction of predators by calcium arsenate, but by the killing of hymenopterous parasites when they emerge in the presence of the arsenical, and they are also killed, though more slowly, by calcium hydroxide, calcium carbonate, and cornstarch.

The woolly apple aphid [trans. title], R. DIEUZEIDE (*Rev. Zool. Agr. et Appl.*, 26 (1927), Nos. 6, pp. 81-92, figs. 2; 7, pp. 97-106, pls. 2, figs. 4).—An account of this insect as it occurs in France, including a bibliography of five pages.

Combating the beech coccid and the woolly apple aphid [trans. title], L. REH (*Anz. Schädlingsk.*, 3 (1927), No. 2, pp. 19-21, figs. 2).—*Cryptococcus fagi* Bär. on beech near Hamburg was controlled, without injuring the trees, by painting the trunks with a mixture of equal parts of coal tar and petroleum. Apple trees were kept free from the woolly apple aphid by painting in the spring with a mixture of two parts of wood tar and three parts of linseed

oil, petroleum being used as a thinner. The application should be made in February in dry cloudy weather. Used against *Hylesinus fraxini* Panz. in ash, the mixture penetrates its mines and kills the larvae and adults.

Citrophilus mealybug in California, A. A. BROCK (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 6, pp. 342-344).—A brief account of this pest in California.

Status and synonymy of the dictyospermum scale, J. C. CHAMBERLIN (*Calif. Dept. Agr. Mo. Bul.* 16 (1927), No. 9, pp. 484-491, figs. 6).—A review of the present knowledge of *Chrysomphalus dictyospermi* (Morg.) a rather severe infestation of which in palms out of doors in Los Angeles, Calif., has been discovered. While often found in the State, in nearly all cases as a greenhouse pest, it apparently never before successfully established itself out of doors.

Pseudococcus maritimus Ehrhorn, a pest of *Gladiolus* and *Calla*, F. F. SMITH (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 843, 844).—A report of observations of injury by this pest in Pennsylvania.

Mealybugs, G. F. FERRIS (*Calif. Dept. Agr. Mo. Bul.*, 16 (1927), No. 6, pp. 336-342).—A practical summary of information given as an address in May, 1927.

Results of the seventh year's work against the gipsy moth in New Jersey, H. B. WEISS ET AL. (*N. J. Dept. Agr. Circ.* 127 (1927), pp. 12, figs. 8).—This is a detailed progress report (*E. S. R.*, 56, p. 360) of the eradication work under way in New Jersey. It is concluded that while there was an increase in the number of colonies during the year the outlook for extermination is good. Twelve colonies totaling 646 new egg clusters were found.

The pine moth in Bavaria.—A historical, statistical, climatological contribution [trans. title], BERWIG (*Forstwiss. Centbl.*, 48 (1926), Nos. 5, pp. 165-181; 6, pp. 209-217; 7, pp. 259-267, figs. 2; 8, pp. 293-297; 9, pp. 318-323).—This paper includes an extended account of outbreaks of this pest in Bavaria from as early as 1449, the factors influencing its abundance, etc.

Scouting, quarantine, and control for the European corn borer, 1917-1926, L. H. WORTHLEY and D. J. CAFFEY (*U. S. Dept. Agr., Tech. Bul.* 53 (1927), pp. 143, figs. 39).—After a brief introduction, an account is given of the distribution and bionomics of the corn borer (pp. 2-12), followed by a discussion of scouting for the corn borer (pp. 13-17), quarantines on account of the European corn borer (pp. 18-32), repressive measures (pp. 32-133), annual progress of infestation (pp. 133-142), and a list of six references to the literature. The work reported upon covers the period from the spring of 1919 to January 1, 1927.

On temperature experiments with the eggs of the Mediterranean flour moth [trans. title], A. HASE (*Arb. Biol. Reichsanst. Land u. Forstw.*, 15 (1927), No. 2, pp. 109-133, figs. 7; abs. in *Rev. Appl. Ent.*, 15 (1927), Ser. A, No. 6, p. 311).—This is a detailed account of experiments conducted in which more than 300,000 eggs were used.

The bud moths Tmetocera (Eucosma) ocellana F. and Olethreutes variegana Hb. as enemies of the apple in Valais in 1926 [trans. title], R. WIESMANN (*Anz. Schädlingssk.*, 3 (1927), Nos. 8, pp. 87-91, figs. 7; 9, pp. 103-108, fig. 1).—This is an account of the eye-spotted bud moth and *O. variegana*, their biology and injury caused in the Canton of Valais, Switzerland.

Some effects of alternating temperatures on the growth and metabolism of cutworm larvae, W. C. COOK (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 769-782, figs. 7).—The first part of this contribution from the Montana Experiment Station reports upon experiments in which larvae of the pale western cutworm were reared with daily alternations of high and low temperature. Growth was accelerated by these alternations, the highest acceleration being for an 8-hour exposure to high temperatures. The second part of the paper discusses experiments in which the metabolism of the army cutworm larvae was measured after

varying exposures to high temperatures. It was again found that metabolism, as measured by carbon dioxide output, showed a maximum for an 8-hour exposure.

Quantitative methods of collecting and rearing soil cutworms, K. M. KING and N. J. ATKINSON (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 821-830).—This is a detailed account of methods employed by the authors in Saskatchewan.

Zoological contributions to the surra problem.—IV, On the development of *Tabanus striatus* Fab. [trans. title], O. NIESCHULZ (*Dept. Landb., Nijv. en Handel Nederland. Indië, Veeartsenijl. Meded.*, No. 56 (1926), pp. 21, pls. 2, figs. 3; *Ger. abs.*, pp. 17-19).—An account of studies at Buitenzorg of the morphology and biology of one of the most generally distributed and important transmitters of surra in the Indian Archipelago (*E. S. R.*, 56, p. 461).

Combating the spinach leaf miner (*Pegomya hyoscyami* Panz.) with sodium fluoride and sodium fluosilicate [trans. title], H. BREMER and O. KAUFMANN (*Anz. Schädlingssk.*, 3 (1927), No. 2, pp. 13-15).—Tests made by the authors showed sodium fluoride and sodium fluosilicate to be effective against *P. hyoscyami* and harmless to the beet when 0.4 per cent of either solution is applied with 2.5 per cent of sugar at the commencement of oviposition.

The Japanese beetle in New York State (*N. Y. State Dept. Agr. and Markets Circ.* 324 (1927), pp. 19, figs. 8).—A practical summary of information on this insect, with a copy of the quarantine order and regulations promulgated.

An improved carbon disulfide emulsion for the control of larvae of the Japanese beetle and other insects, J. W. LIPP (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 801-805, pl. 1).—This is a report upon a carbon disulfide emulsion that has been prepared in which rosin, C. P. sodium hydroxide, and U. S. P. oleic acid are used to form the emulsifying agent. It has been found that in this way variation in the composition of the emulsifying agent is cut to a minimum. This emulsion is the one being recommended for the treatment of turf and of nursery stock for the control of Japanese beetle larvae. It has also given good results against the larvae of the Asiatic beetle (*Anomala orientalis* Waterh.) and of the green June beetle.

A preliminary report on the factors controlling the oviposition of May beetles in Minnesota (Phyllophaga, Scarabaeidae, Coleoptera), H. L. SWEETMAN (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 783-794, figs. 2).—This contribution from the Minnesota Experiment Station is a preliminary report upon the factors influencing oviposition in Minnesota as determined from the presence of May beetle larvae in 1925 and eggs and beetles in 1926. It is concluded that the beetles studied do not select places for oviposition according to the vegetational covering, but fly at random from the food plants. Wind is usually not of importance in the evening but influences the direction of flight in the morning. The oviposition takes place in the immediate vicinity of food plants regardless of elevation or type of soil when the physical conditions are suitable.

Studies on the morphology and biology of *Phyllopertha horticola* L. and *Anomala aenea* Geer. (Coleopt.), K. RITTERSHAUS (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere*, 8 (1927), No. 3-4, pp. 271-408, figs. 149).—The studies of the two European scarabaeid beetles, here reported, are accompanied by a three-page list of references to the literature.

The hibernation of the beet silphid beetle (*Blitophaga opaca* L.) [trans. title], H. BREMER (*Anz. Schädlingssk.*, 3 (1927), No. 1, pp. 1-5).—This is an account of a silphid enemy of the beet in north Germany, where it occurs in large numbers locally but is not generally distributed.

On the pair of so-called sensory pits of the ninth abdominal segment of the wireworm (*Agriotes obscurus* Linn.) with additional notes on the

internal anatomy, H. C. JAMES (*Ann. Appl. Biol.*, 14 (1927), No. 4, pp. 470-481, figs. 9).—This is a contribution from the zoological laboratory at Cambridge University.

A European nitidulid, *Brachypterolus pulicarius* L. (Coleoptera, family Nitidulidae), G. E. R. HERVEY (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 809-814, fig. 1).—This is an account of a small black beetle, probably introduced from Europe, which has been found by the author in New York State to feed upon blossoms of a variety of plants, including strawberries, to which it is not known to be a source of injury. It breeds only in *Linaria vulgaris*.

A study of the biology of the parsley stalk-weevil *Listronotus latiusculus* Boheman. Coleoptera: Curculionidae, A. M. BOYCE (*Jour. Econ. Ent.*, 20 (1927), No. 6, pp. 814-821, pl. 1, fig. 1).—This is a report of a year's study of the parsley stalk weevil (*L. latiusculus*), which occurs in the market garden section of Long Island near New York City and appears to be a serious menace to carrot growing.

[Report of apiary work], C. F. BAILEY (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1926*, pp. 67-73).—This report deals with the control of swarming by dequeening and requeening and by separation of queen and brood; a method for detecting preparation for swarming; wintering in cellar, in four-colony, two-colony, and single-colony cases; two-queen system of carrying a number of surplus queens through the winter; comparison of the different sizes of hives; package bees as a means of starting colonies; outdoor v. cellar wintering; and queen rearing.

[Report of bee work], W. A. MUNRO (*Canada Expt. Farms, Rosthern (Sask.) Sta. Rpt. Supt. 1926*, pp. 56-58).—This report deals with package bees, the honey crop, swarm control, queen rearing, and preparation for wintering.

Etiology of European foul-brood of bees, D. R. A. WHARTON (*Science*, 66 (1927), No. 1715, pp. 451, 452).—The author reports having developed a medium well suited for the growth of *Bacillus pluton* (White), pure cultures of which can be readily obtained provided the larvae used contain a preponderance of this organism. A 0.15 per cent concentration of agar, together with certain nutrients, is used as an enrichment medium, and a concentration of 1.5 per cent agar for the isolation of the organism at 37° C. Morphological studies conducted are said to suggest the identity of *B. pluton* and *B. alvei*, cultures of *B. pluton* having been observed to change to the *B. alvei* form and resembling biologically the *B. alvei* isolated from infected larvae.

Note on the activities of humble bees (*Bombus*) in North Wales, C. L. WALTON (*Ann. Appl. Biol.*, 14 (1927), No. 4, pp. 465-469).—A brief account is given of the species of bumble bees observed by the author in North Wales and adjacent districts from 1919 to 1927, with notes on their relative abundance and seasonal activities. The chief economic plants visited by each species are listed, together with brief mention of those cultivated and wild flowers most favored.

The life history of *Exeristes roborator* Fab., a parasite of the European corn borer, J. H. FOX ([*Canada*] *Natl. Research Council Rpt. 21* (1927), pp. 58, pls. 14).—This is a detailed account of biological studies, made in the Province of Ontario, of an ichneumonid parasite of the European corn borer which has been introduced from Europe, reared in the United States, and established in infested areas near Boston, Mass. It was found to develop over a wide temperature range, and thus may be expected to appear fairly early in the spring and to continue development until late in the fall. Subject to certain dormancy conditions it was able to live through the winter and endure a minimum temperature of -8° F.

Parthenogenesis occurred, unfertilized eggs hatching into males. Females mated most readily on the second day after emergence, and did not mate readily after the fifth day.

In the ovipositor the females possess a remarkably efficient instrument for puncturing the stalks. They actively hunt for corn borers and kill a large number for food alone, besides stinging and ovipositing upon them. Both males and females are fond of honeydew, and it is probable that they obtain the sugar constituent in their diet from this source. The adult is remarkably well equipped to meet the problems of emergence, emergence through 3 in. of moist soil being readily effected.

Investigations up to the present have brought out considerable evidence pointing to an efficiency and adaptability in the parasite which is very favorable to its establishment in Ontario.

Euparagia scutellaris Cresson, a masarid wasp that stores its cells with the young of a curculionid beetle, F. X. WILLIAMS (*Pan-Pacific Ent.*, 4 (1927), No. 1, pp. 38, 39).—A brief account of a wasp observed in the vicinity of Lake Tahoe in California.

Concerning *Dielocerus formosus* Klug* (Hymenoptera, Tenthredinoidea) [trans. title], A. DA COSTA LIMA (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 31, pp. 1366, 1367).—The author records the observation of an aestivation of larvae of this saw fly in their cocoons. He refers to observations of this species reported by Sichel in 1862 indicating that the larvae may continue in this latent state for at least three years.

On *Telenomus fariai*, a new endophagous parasite of the eggs of *Triatoma megista* Burm. [trans. title], A. DA COSTA LIMA (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 31, pp. 1350, 1351).—This is a contribution from the Oswaldo Cruz Institute in Brazil, in which the parasitism of the eggs of *T. megista* by the microhymenopteran *T. fariai* is reported for the first time. Eight was the average number of parasites reared from one egg, with a maximum of twelve.

Contribution to the study of the resistance of eggs and larvae of Ixodidae to vapors of antiseptics: Practical utilization of ammonia vapors [trans. title], GRANOUILLET, THU, and KHOAN (*Rev. Vét. [Toulouse]*, 79 (1927), Nov., pp. 615-619, fig. 1).—The abundance of ticks of the genus *Haemaphysalis* on cattle in the pound at Cantho, Cochin China, in 1927, led to the investigation here reported. When kept in tubes the larvae survived for from 20 to 25 days, the nymphs from 25 to 28 days, and the adults from 32 to 33 days. In experiments with chemicals, ammonia gave the best results. It was found that the fumes from a solution of commercial ammonia, when permitted to volatilize or heated to hasten the process, proved fatal to the eggs and larvae within a few minutes.

Studies on the South American tick, *Ornithodoros venezuelensis* Brumpt, in Colombia, L. H. DUNN (*Jour. Parasitol.*, 13 (1927), No. 4, pp. 249-255).—This contribution deals with the prevalence, distribution, and importance of *O. venezuelensis*, an intermediate host of relapsing fever. Tests made for the presence of the causative organism of relapsing fever in 61 lots of this tick collected in 68 houses in 20 villages, towns, and cities in various parts of Colombia indicated that spirochete-infested ticks were present in 27.86 per cent of the houses.

ANIMAL PRODUCTION

Animal nutrition, T. B. WOOD (*London: Univ. Tutorial Press*, 1927, 2. ed., pp. VIII+226, figs. 5).—The second and revised edition of this book, previously noted (*E. S. R.*, 52, p. 267). The revisions concern the fundamental data for

feeding pigs and the figures for digestible protein of roots and the starch equivalent content of hays and straws.

Long-bone length and body sizes, F. S. HAMMETT (*Science*, 66 (1927), No. 1707, p. 265).—The relationship of bone length to body length of albino rats was studied at the Wistar Institute. Measurements were made of the humerus and femur bones of the male and female rats at intervals from 23 to 150 days of age. It was found that after puberty (about 65 days) the ratio between humerus length and body length and femur length and body length was practically constant, notwithstanding the increase in size of bone and body. The humerus length bears the more constant ratio to body length, that of the femur tending to increase slightly with age.

Bulk in animal feeding, F. PROCTER and N. C. WRIGHT (*Jour. Agr. Sci. [England]*, 17 (1927), No. 3, pp. 392-406, pl. 1, figs. 2).—Investigations were undertaken at the University of Reading, England, to measure the bulk occupied by equal weights of different foods in the stomachs of animals. In the laboratory 10 gm. of milled feeds that would pass through a No. 30 sieve were placed in dry cylinders and their volume determined. Sufficient water at 33° C. (100° F.) was then added to bring the volume to 50 cc. (100 cc. in the case of high-swelling feeds), and the whole stirred. They were then placed in an incubator at 33° and readings of volume made at intervals of 2, 4, and 6 hours. The rate of swelling is important, although hard to measure in this test, but indications were that food has reached its full extent of swell by the time it reaches the stomach. The amount of swelling varied greatly, being lowest in the meat and fish meals and highest in some vegetable cakes as linseed and coconut cake. On the basis of 10 gm. of dry weight the volume after soaking varied from 24 to 88 cc. The high-swelling feeds after soaking contained approximately the same percentage of water as some bulky feeds, such as roots. The authors suggest that the swelling of feed might be due to (1) absorbing of water by proteins, (2) swelling of the starch granules, and (3) the influence of salts present.

Fourteen pigs of from 40 to 80 lbs. in live weight were fed by the reversal method on high- and low-swelling rations made up in such a manner that the starch equivalent and digestible proteins of the comparable rations were approximately the same. The bulk occupied by the ration did affect the quantity of feed consumed. Negative results were obtained with calves fed similar rations as far as food consumption was concerned.

Minimum mineral requirements in cattle, A. THEILER, H. H. GREFFN, and P. J. DU TOIT (*Jour. Agr. Sci. [England]*, 17 (1927), No. 3, pp. 291-314, figs. 6).—Continuing the study of the mineral requirements of cattle (E. S. R., 52, p. 670), the Department of Agriculture, Union of South Africa, fed yearling cattle on rations in which the roughage was cut to a minimum and concentrates used to meet the major requirements. The roughage consisted of hay poor in minerals, but of fair quality. The concentrate was rolled endosperm of corn, low in minerals but having a high heat value and a fair protein content. Two oz. of blood meal per day was added to the ration to insure the iron content and to vary the protein. Different minerals in varying amounts were fed with this ration to ascertain the minimum requirement and the effect of a varying ratio of calcium and phosphorus. A final ration in which green forage replaced part of the hay was fed to check the vitamin factor.

It was found that the phosphorus requirement for growth is higher than the calcium requirement, a ratio of 3:1 of phosphorus to calcium not being out of line. Two gm. of sodium oxide and less than 5 gm. of chlorine per day are required. The animals were raised to mature weight when by feeding high

phosphorus rations the usual alkaline reaction of the urine was shifted to the acid side. Abnormal calves were born in the group receiving rations deficient in phosphorus. "Aphosphorosis" was produced clinically on phosphorus deficient rations and found to be identical with the naturally occurring disease, *Styfsiekte*. Aphosphorosis did not necessarily change the chemical composition of the milk produced, but the inorganic phosphorus fraction of the blood may drop to a quarter of the normal with this condition. The blood calcium and other phosphorus compounds remained normal. No harmful effects were found from any vitamin deficiencies of the ration.

What do range live stock eat? V. L. CORY (*Cattleman*, 14 (1927), No. 5, pp. 23-25).—Continuing this series of studies at the Texas Ranch Experiment Station (E. S. R., 58, p. 166), it has been found that miscellaneous feeding supplies 11.16 per cent of the total feeding of range livestock. Of the miscellaneous feeding, 45 per cent is done by cattle, 35 per cent by sheep, and 20 per cent by goats. Livestock spent 85.48 per cent of their miscellaneous feeding time eating sacahuiste, 8.87 per cent on mast, 1.52 per cent on mushrooms, and 1.34 per cent on yucca. Other plants that occupy less than 1 per cent of their time are mesquite pods and leaves, prickly pear, oak leaves, and *tasajillo*. The author gives a brief general description of each of these plants, tells what parts of the plants are eaten by the animals, and which class of stock eats them most readily.

Live stock feeding habits, V. L. CORY (*Cattleman*, 14 (1927), No. 6, pp. 24-26).—In concluding this series of studies at the Texas Ranch Experiment Station (see above), it has been found that supplementary feeding occupies 2.88 per cent of the total feeding time of livestock. Of this supplementary feeding 1.07 per cent is done by cattle, 1.15 per cent by sheep, and 0.66 per cent by goats. Hay is the most important of the supplementary feeds, making up 39.93 per cent of all supplementary feeding. Fodder, next in importance, makes up 27.43 per cent, cottonseed cake 21.18, spineless cactus 6.25, silage 2.78, and bone meal 2.43 per cent. The author points out that this percentage of supplementary feeding may be high for certain sections, but emphasizes the value of such feeding for preventing losses and increasing crop production.

The nutritive value of grasses, as pasture, hay, and aftermath, as shown by their chemical composition, T. W. FAGAN (*Univ. Col. Wales, Aberystwyth, Agr. Dept., Advisory Bul. 2* (1927), pp. 23).—The agricultural department of the University College of Wales has made a study of the nutritive value of certain grasses as shown by their chemical composition and mostly as pasture, hay, and aftermath. Among the grasses studied were cocksfoot, perennial ryegrass, Yorkshire fog, red fescue, timothy, tall and golden oat grass, meadow foxtail, and sweet vernal.

It was found that individual grasses varied in their composition when cut at different times during the pasture season, this variation being nearly as great as the seasonal variation. The ability to withstand grazing and the leafiness of the growth influence the yield and chemical composition of the plant. The more the grasses are grazed the leafier they become and the greater is their value as far as chemical composition is concerned. Hard grazing reduces the yield of dry matter, but that obtained is of superior composition. The time of cutting the grass for hay influences its composition, early cutting being more desirable than late cutting. Delaying the grazing of aftermath increases the yield but decreases the nutritive value of the plant, especially of the leaves.

The chemical composition and digestibility of different cuttings of alfalfa [trans title], E. NEDUCHETOVA and N. GORAINOVA (*Izv. Saratovsk. Gosud. Inst. Sel'sk. Khoz. i Melior.*, No. 3 (1927), pp. 99-105).—Digestion trials with sheep were made to determine the value of four cuttings of alfalfa hay.

The first cutting was made before blooming time at the end of May and at blooming time in early June, the second cutting before blooming at the end of June, the third when blooming began at the end of July, and the fourth when blooming began at the end of August. The coefficient of digestibility of all the components was determined, and from these coefficients the amount of each component digested was calculated and the figures converted into starch values, using 1 gm. of crude fiber as equivalent to 0.58 gm. of starch. The starch value of hay cut before blooming was higher than that of hay cut after blooming. The feeding value of the different cuttings varied but little, although there were differences in the chemical composition. First cutting hay was lower in albumin, fat, and nitrogen-free extract, but higher in ash and cellulose than second cutting. The starch values of the third and fourth cuttings were approximately equal.

Digestion and metabolism experiments with sheep fed on mixed hay, M. SAITOH (*Bul. Agr. Chem. Soc. Japan*, 3 (1927), No. 4-6, pp. 49-51).—Digestion trials with two mature sheep fed a maintenance ration of mixed hay are reported. The hay used was high in potash and lime as compared with soda and magnesia, respectively. The digestibility of the various constituents did not vary greatly from results obtained elsewhere. A study of the nitrogen metabolism led the author to believe that the production of hippuric acid in the body should be largely attributed to the carbohydrates of the feed, and the glycocholic acid can be made from the amino acids of the food proteins as well as from the food glycocholic acid. There was a positive mineral balance of all elements except soda and magnesia. Of the potash, from 80 to 88 per cent was excreted in the urine and only 11 to 16 per cent in the feces, and of the soda, 25 to 29 per cent was excreted in the urine and 80 per cent in the feces. Lime was excreted almost entirely in the feces, as were phosphoric acid and iron oxide and all but 18 to 28 per cent of the magnesia. Chlorine was entirely eliminated in the urine, and the excretion of sulfur was divided equally between the feces and urine.

The nutritive value of swedes, marrow stem kale, and sugar beet tops, T. B. WOOD (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 8, pp. 697-705, figs. 2).—A series of sheep feeding trials conducted jointly by the Cambridge Animal Nutrition Research Institute and the Norfolk Agricultural Station, England, furnished material for calculating the real nutritive value of marrow stem kale, sugar beet tops and crowns, and two samples of swedes. A new formula was used in these calculations:

$$R=M+GK,$$

in which R equals the average ration per head per week in pounds of starch equivalent, M the average maintenance requirement in pounds of starch equivalent, G the average live weight increase per head per week in pounds, and K the weight in pounds of starch equivalent required to make 1 lb. of live weight increase. This equation has been found to be justified if the animals are quiet and do not waste too much starch equivalent in movement. R can be calculated from the ration and G from periodical weighings. M and K can be read from curves previously calculated by the author (*E. S. R.*, 57, p. 763).

From these calculations it was found that the starch equivalent per 100 lbs. of Norfolk swedes was 5.84 lbs., Fen swedes 5.15, marrow stem kale 7.14, and sugar beet tops and crowns 8.8 lbs.

Report of the animal husbandry division, G. B. ROTHWELL ET AL. (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1926*, pp. 67, figs. 14).—This publication gives brief accounts of experimental work conducted with beef and dairy cattle, horses, swine, and sheep at the Central Experimental Farm, Ottawa,

Can. In addition, progress reports are noted on animal hybridization at Buffalo Park, Wainwright, Alta.

Chemical studies on sex differences of proteins in animals and plants.—I, Sex differences of muscle and serum-proteins, T. TADOKORO, M. ABE, and S. WATANABE (*Imp. Acad. [Japan], Proc.*, 3 (1927), No. 8, pp. 543-546).—Experiments at the Tohoku Imperial University, Sendai, Japan, indicated that sex differences may be determined by chemical analyses of the muscle proteins. Samples of myosin and myogen were prepared from muscles of a bull and cow, cock and hen, and male and female rabbits. The ash and phosphorus content of these samples were always greater in the female samples. It required less hydrochloric acid solution to titrate the alkaline solutions of myosin and myogen of the female proteins when measuring maximum surface tension and turbidity. The specific rotatory power and the free amino nitrogen content of the female solution were always lower than that of the male solution. The contents of arginine and lysine were higher in the male protein, and the histidine content higher in the female protein. Similar results were obtained with clear blood serum globulin prepared from a bull and cow, man and woman, and stallion and mare.

Ancient slaughtering methods: Origin and evolution of European slaughtering methods, R. A. CLEMEN (*Cattleman*, 14 (1927), No. 5, pp. 12-18, figs. 7).—The author traces the development of slaughtering methods from prehistoric times up to the present. Of special interest is the Egyptian system of about 2,000 B. C. as ascertained from models obtained from excavations of a tomb. The history and development of the meat industry and methods of distribution in Great Britain, Germany, and France are discussed, emphasizing especially their good points and limitations.

[**Experiments with steers at the Scotts Bluff Field Station**], J. A. HOLDEN (*U. S. Dept. Agr. Circ.* 5 (1927), pp. 39-43).—The results of three experiments in cooperation with the Nebraska Experiment Station are reported.

Pasturing experiment with steers.—Three lots of 25 3-year-old steers each, averaging 757 lbs., were placed on pasture May 16, 1923. Lot 1 was put on sweet clover pasture and fed corn, lot 2 on sweet clover without grain, and lot 3 on an 800-acre native grass pasture. The sweet clover pastures were divided and the steers alternated from one to another. There was 1 acre of pasture for each 3 steers. This proved more than sufficient for lot 1 but not enough for lot 2, which was removed on August 13 to native pasture. It required 72 days to bring the steers in lot 1 to a full feed of corn. The hogs following these cattle made a total gain of 66 lbs. per steer. The total gain of the steers in the respective lots was 255, 133, and 225 lbs. per head. Each steer in lot 1 consumed 2,094 lbs. of corn during the 135-day test.

In 1924 2 lots of 12 2-year-old steers each, averaging 974 lbs., were placed on test. Lot 1 was put on sweet clover pasture with corn and dried beet pulp and lot 2 on 800 acres of native grass. The test lasted 135 days. The average total gain per steer was 251 and 126 lbs., respectively. In addition to the pasture the steers in lot 1 consumed 759 lbs. of corn and 137 lbs. of dried pulp for each 100 lbs. of gain. The hogs following these steers made an average of 66 lbs. of pork per steer.

Steers on range pasture.—During a 4-year period an average of 37 head of steers has grazed on an 800-acre native pasture for 138 days per season. They have made an average total gain of 198 lbs. per head during this time.

Wintering steers.—It was found that it required an average of 1.22 tons of alfalfa hay, 0.71 ton of silage, the tops from 6.5 tons of sugar beets, and 250 lbs. of dried beet pulp to winter a 2-year-old steer during a period of 136 days. Under this system of feeding the steers made an average gain of 153 lbs. each.

Factors in beef production, H. M. GARLOCK (*Missouri Agr. Col. Ext. Circ.* 189 (1927), pp. 8, fig. 1).—The author discusses such factors affecting beef production as buying or raising feeder cattle, the seasonal markets for different grades of cattle, age of cattle, winter or summer feeding, and heifers versus steers.

Heifer beef versus steer beef, F. S. HULTZ (*Cattleman*, 14 (1927), No. 5, pp. 39-41).—The author discusses the basis for the discrimination against heifer meat. After reviewing the experimental work comparing heifers and steers as meat producers he concludes that up to 12 to 15 months of age the heifer carcass may actually be superior to the steer carcass of animals bred and fed similarly. After this time the female becomes "cowy," and the packer runs the risk of less profit from heifers due to possible pregnancy, less value of hide, and the possibility of dissatisfaction from the consumer.

Cattle breeding in the Bombay Presidency: Principles and progress, E. J. BRUEN (*Bombay Dept. Agr., Bul.* 136 (1927), pp. [2]+20, pls. 12).—A popular bulletin of the principles and practices of cattle breeding in India. Among the topics discussed are the methods of breeding in the past, obstacles to cattle improvement, breeds of cattle, and efforts at improvement. Appended are reports of progress in the improvement of milking qualities and early maturity of several breeds at the Northcote Cattle Farm, Chharodi.

The Texas Longhorn preserved from extinction, W. C. BARNES (*Jour. Heredity*, 18 (1927), No. 10, pp. 443-446, figs. 3).—The author discusses the establishment of a herd of Texas Longhorn cattle in the Wichita National Forest and Game Preserve.

Cattle brands and branding, W. C. BARNES (*Cattleman*, 14 (1927), No. 7, pp. 15-17, figs. 3).—The author traces the history of the branding of livestock in this country. The injury to the leather due to side and large brands and the difference in price between branded and unbranded hides are pointed out. The results of attempts and failures to brand cattle with some chemicals to remove the hair but not injure the hide are noted.

[Experiments with sheep at the Scotts Bluff Field Station], J. A. HOLDEN (*U. S. Dept. Agr. Circ.* 5 (1927), pp. 34-38, fig. 1).—The results of two experiments in cooperation with the Nebraska Experiment Station are noted, as well as one with lambs noted previously (*E. S. R.*, 56, p. 562).

Pasturing sweet clover with broken-mouthed ewes and lambs.—Thirty-six ewes and 38 lambs were turned into a 3-acre sweet clover field on May 2, 1923. During the 132-day grazing period the ewes gained 540 lbs. and the lambs 2,320 lbs. In 1925 one lot of 40 ewes and 42 lambs, which were lambled before the end of April, had the run of 3 acres of sweet clover, and a second lot of 75 ewes with 78 lambs, which were lambled after the ewes were placed in pasture, were kept on 4 acres of sweet clover. The ewes and lambs were placed on pasture April 28 and those in the first lot received 1 lb. of grain per head, while the second lot were on a limited grain feed for the first part of the season and later the lambs received 0.5 lb. of grain per head daily. On July 1, lot 1 and 15 ewes from lot 2 were marketed, and from then on the remaining animals had the 7 acres of pasture. The ewes made a total gain of 845 lbs. and the lambs 6,263 lbs. when handled in this manner.

Sweet-clover pasture and corn silage compared.—In this test 3 lots of ewes and lambs were fed. Lot 1 consisted of 40 ewes and 42 lambs and was pastured on 3 acres of sweet clover. In addition the ewes each received 50 lbs. of dried beet pulp and 10 lbs. of cottonseed cake, while the lambs alone received an additional 20 lbs. of dried pulp, 16 lbs. of corn, and 4 lbs. of cottonseed cake. Lots 2 and 3, consisting of 20 ewes and 22 lambs each, were both fed in dry lot receiving alfalfa hay and corn silage. The feeding of concentrates in lot 2 was

identical with the plan in lot 1, but in lot 3 the ewes and lambs received all their concentrates in one pen. The ewes gained 525, 45, and 125 lbs. in the respective lots, while the lambs gained 1,660, 710, and 555 lbs., respectively. More grain and cake were required to make 100 lbs. of gain in dry lot than on sweet clover pasture. It was found that 1 acre of sweet clover pasture for a period of 60 days had a feeding value equal to 1.19 tons of alfalfa hay, 2.2 tons of corn silage, 676 lbs. of dried pulp, 154 lbs. of corn, and 132 lbs. of cottonseed cake.

Size of fine wool range ewes in relation to production, W. E. JOSEPH (*Natl. Wool Grower*, 18 (1928), No. 1, pp. 31, 32, figs. 2).—Records were kept at the Montana Experiment Station of four lamb crops of 333 range ewes of fine wool breeding, ranging in weight from 80 to 159 lbs. the first of the year in their mature form. Lambs were weighed at an average age of 148 days.

The ewes were divided into groups according to weight. Those weighing less than 100 lbs. produced an average of 21 lbs. less lamb and 1.5 lbs. less wool than those averaging 130 lbs. or more. The percentage of twin lambs raised and the average weight of the pairs were higher for the heavier ewes. The author recommends that weight alone should not be the sole basis for culling ewes, but that the lambs from the larger ewes, other things being equal, should be given preference over those from lighter ewes when used for replacements.

The supplementary relation between the proteins of corn and of tankage determined by metabolism experiments on swine, H. H. MITCHELL and C. H. KICK (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 9, pp. 857-864).—The Illinois Experiment Station conducted nitrogen metabolism trials with 8 young Poland-China barrows. Tests on 3 animals were separated by a year from the other tests. The pigs were confined in metabolism crates, and daily collections were made of feces and urine. In most cases the collection periods were for 10 days. The test periods were separated by from 7 to 10 days of preliminary feeding, in which the pigs received the ration to be used the next collection period.

During the first period the pigs were on a nitrogen-free ration composed of 96 per cent of cornstarch and 4 per cent of a mineral mixture of steamed bone meal, ground limestone, sodium chloride, magnesium carbonate, potassium carbonate, potassium sulfate, ferric chloride, and potassium iodide. After 12 to 14 days of such feeding, the output of urinary nitrogen had reached a level. The second period involved the feeding of corn, the third corn and tankage in the ratio of 2 parts of corn nitrogen to 1 part of tankage nitrogen, the fourth period tankage, and the fifth period the standardizing ration of starch. In each period the pigs received 4 per cent of the mineral mixture and either 2 or 5 per cent of cod-liver oil.

The average coefficients of digestibility of protein, corrected for metabolic nitrogen of the feces, were 85 for corn, 76 for tankage, and 82 for the mixture. It was found that the average biological values for proteins were 54 for corn, 42 for tankage, and 61 for the mixture. The authors concluded that while the crude protein of tankage has a low nutritive value for growing pigs, when combined with corn protein it has a marked supplementary value, giving the mixed proteins a slightly higher biological value than that of corn alone.

The influence of oil meal feeding on the quality of hog and milk fats [trans. title], G. V. BOGAEVSKIY (*Izv. Saratovsk. Gosud. Inst. Selsk. Khoz. i Melior.*, No. 3 (1927), pp. 87-98).—The fat of the carcasses of three groups of bacon type hogs of two pigs each was subjected to criticism by bacon experts and to chemical and physical analyses. These pigs had been fed for eight weeks on the following rations: Lot 1 barley, lot 2 extracted hemp oil meal, and lot 3 unextracted sunflower oil meal. The fat in lots 1 and 2 passed as satisfactory bacon fat; that in lot 3, however, was of very poor quality and buttery. The

solidification temperature, the Glöbel number, and the Köttstorfer number showed the fat in lot 3 to be of poor quality.

Unextracted oil meals fed to dairy cows reacted unfavorably on the quality of the butter produced as judged by the Reichert-Meisli number. Extracted oil meals had no unfavorable effects.

Alfalfa pasture for hogs [at the Scotts Bluff Field Station], J. A. HOLDEN (*U. S. Dept. Agr. Circ. 5* (1927), pp. 30, 31).—In continuing the tests of pasturing 0.25-acre plats of alfalfa with hogs (*E. S. R.*, 51, p. 175) in 1925, in cooperation with the Nebraska Experiment Station, 20 fall pigs gained 960 lbs. during the spring period and 36 spring pigs gained 2,020 lbs. during the summer period. This total gain of 2,980 lbs. is comparable to the average gain of 2,975 lbs. for a 12-year average. During 1925 an average of 3.1 lbs. of corn was consumed per pound of gain as compared with 2.62 lbs. of corn for the 12-year average. The pigs received a 2 per cent ration of corn while on pasture.

Fattening rations for swine, M. F. GRIMES (*Pennsylvania Sta. Bul. 215* (1927), pp. 15, figs. 3).—The first section of this publication, dealing with the value of blackstrap molasses and bakery refuse as substitutes for corn, is a compilation of work previously noted (*E. S. R.*, 50, p. 469; 56, p. 165; 58, p. 359).

The second section is a comparison of the ability to produce gains and the economy and palatability of wheat, Palmo, and buckwheat middlings. Corn and tankage proved to be superior to rations in which any of the three middlings replaced a portion of the corn. Pigs consumed but small amounts of either buckwheat or Palmo middlings when these feeds were self-fed. Palmo middlings produced gains more cheaply than wheat middlings, and the latter was superior to buckwheat middlings.

Dogs: Their history and development, E. C. ASH (*London: Ernest Benn, 1927, vols. 1, pp. XVIII+384, pls. 109, figs. 21; 2, pp. XVI+385-778, pls. 53, figs. 21*).—A treatise in two volumes discussing the history and development of the domesticated dog, together with the origin and improvement of the various breeds of dogs.

The nitrogenous constituents of hen urine, R. E. DAVIS (*Jour. Biol. Chem.*, 74 (1927), No. 3, pp. 509-513).—After developing a method to collect urine from hens without contamination with feces, the Ohio Experiment Station conducted 14 trials with 5 hens to determine the nitrogenous constituents of the urine. It was found that the uric acid nitrogen averaged 62.9 per cent of the total urinary nitrogen. Ammonium nitrogen averaged 17.3 per cent, urea nitrogen 10.4, and the creatine plus creatinine 8 per cent of the total nitrogen. Since there probably is an unknown reabsorption of urea, creatine, and creatinine in the cloaca, it is not feasible to calculate urinary nitrogen from the uric acid in the droppings.

Seasonal broiler production, T. B. CHARLES (*Pennsylvania Sta. Bul. 216* (1927), pp. 19, figs. 2).—In concluding this experiment (*E. S. R.*, 58, p. 361) it is emphasized that in order to satisfactorily produce broilers for special seasons it is necessary to use disease-free chicks to reduce mortality and be able to market advantageously. Of the original number placed in the station brooder house, 1,141 broilers, or 73.88 per cent, were marketed. When liquid buttermilk formed part of the ration it required 9.32 lbs. of grain and mash and 17.75 lbs. of buttermilk per bird to raise broilers to marketable age, and when no milk was used 10.16 lbs. of grain and mash was required. Production costs were distributed as follows: Feed 46.79 per cent, coal 9.06, labor 22.42, and chicks 21.73 per cent. Shrinkage in shipping ranged from 6.38 to 18.4 per cent, and it was found that birds should be removed from liquid diet two weeks before shipping in order to reduce shrinkage.

Pedigree poultry records, E. W. CALLENRACH (*Pennsylvania Sta. Bul.* 217 (1927), pp. 23, figs. 22).—The author explains and illustrates the reasons and methods of keeping records of poultry for pedigree work. The records deemed necessary are the monthly egg production, individual record, three-year production, male pedigree sheet, pedigree mating and hatching, chick index, individual hatching, progeny record, and daughters of sire record, all of which are illustrated.

Poultry raising in Georgia, J. H. WOOD (*Ga. Agr. Col. Bul.* 280, rev. (1927), pp. 62, figs. 19).—This is a revised edition of the bulletin previously noted (*E. S. R.*, 54, p. 471).

Everyday problems of the poultryman, D. H. HORTON (*Farmingdale, N. Y.: State Inst. Appl. Agr.*, 1927, [rev. ed.], pp. 118, figs. 34).—A handbook designed especially for the practical poultry producer, divided into the following sections: The business of poultry farming, principles of poultry house construction, keeping records, incubators and incubation, brooding and rearing, marketing, feeding, the use of artificial lights, and diseases and parasites.

A study of the growth of White Pekin ducklings, D. H. HORTON (*Farmingdale, N. Y.: State Inst. Appl. Agr.*, 1927, pp. 8).—This is a mimeographed report of results in raising White Pekin ducklings. A total of 329 duck eggs in 4 lots were placed in incubators heated and operated entirely by electricity at the State Institute of Applied Agriculture on Long Island, N. Y. The percentage of hatch varied from 58 to 80 per cent of all eggs set. The temperature during incubation was maintained at 99.5 to 100° F. throughout the hatch. Only 2 ducklings were lost after being placed in the brooder. When removed from the brooder the ducklings had access to a yard, were fed four times daily, and had sufficient water to drink and to wash out their nostrils and eyes but not enough to swim in. After the sixth week they were removed to larger quarters equipped with electric lights, which were kept burning all night. A starter ration was fed for 2 weeks, and the ducklings were then finished on a ration in which corn meal made up one-half the ingredients.

The ducklings weighed 0.126 lb. when hatched, 5.48 lbs. at the end of 10 weeks when part of them were marketed, and 6.04 lbs. at the end of 11 weeks. Each duck had consumed 20.64 and 23.85 lbs. of food at the end of the tenth and eleventh weeks, respectively. In this test it was found more profitable to market ducks at the end of 11 weeks instead of marketing after 10 weeks' feeding.

DAIRY FARMING—DAIRYING

Influence of two planes of feeding and care upon milk production, T. E. WOODWARD (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 283-291).—The U. S. D. A. Bureau of Dairy Industry studied the influence of extra care and feeding during test upon the milk production as compared with production under herd conditions. The cows under test conditions were milked three times daily, fed three times daily on a ration in excess of the common requirements, and kept in box stalls. The ration for the cows under herd conditions was only slightly more than required, and these cows were milked twice daily in stanchions. Test cows were bred to freshening 15 months from previous calving, while herd cows freshened 12 months later. Milk records were corrected for a 346.5 day period.

The test cows produced approximately 50 per cent more milk and butterfat than the cows kept under herd conditions, but economic conditions should be the governing factor in determining which method is to be used. Under no conditions will it be profitable to maintain cows under test conditions if the product is to be disposed of for butter making.

The influence of the age of the cow on the yield and quality of the milk, M. K. WHITE and T. J. DRAKELEY (*Jour. Agr. Sci. [England]*, 17 (1927), No. 3, pp. 420-427, fig. 1.)—The study of the influences that affect the yield and quality of milk (E. S. R., 56, p. 872) has been continued, using the results obtained at the shows held by the British Dairy Farmers' Association to determine the influence of age. Detailed results are given for the Dairy Shorthorn, Red Poll, Lincoln Red, British Friesian, Ayrshire, Jersey, Guernsey, Kerry, and Dexter breeds.

The data show that the yield of milk for all breeds increased rapidly with age, reached a maximum, and then gradually fell off. The age at which these points begin varied with the breed. Two-year-old Shorthorn cows gave only 60 per cent of the mature yield, whereas 2-year-old Jersey and Guernsey cows gave 80 per cent. The percentage of fat increased slightly with age and then decreased, and for all breeds the quality of milk of young cows was richer than that of cows over 6 or 7 years of age. Shorthorns gave the highest percentage of fat in the milk at 4 years of age, while Guernsey, Kerry, and Dexter cows reached their maximum at 3 years. The actual weight of fat rose to a maximum between the fifth and eighth years and then decreased. The percentage of solids-not-fat decreased continuously with age, while the actual weight of these solids increased until about the eighth year.

Relation of Taurine cattle to climate, F. A. DAVIDSON (*Econ. Geogr.*, 3 (1927), No. 4, pp. 466-485, figs. 35).—The author points out the distribution of breeds of cattle in various sections of the United States. The Hereford and Jersey breeds are adapted to range and southern conditions, respectively, not because the climate there is similar to the climate in their native home, but because of the manner in which the breeds have been developed under exposure to the weather during the entire year and with most of their feed in the form of pasture. They were, therefore, on a low plane of nutrition and were easily adapted to the conditions in the sections where they are popular. Other breeds of cattle which have been housed and fed for at least part of the year during their development as a breed, and being on a higher plane of nutrition are not so well adapted to exposure and to dependence on pasture for feed. The author reviews the literature on the effect of climate on milk secretion.

Purebred dairy-sire introduction, W. E. WINTERMEYER (*U. S. Dept. Agr. Circ. 6* (1927), pp. 24, figs. 13).—The author describes the methods of organizing and managing a cooperative bull association and the carrying on of a county-wide and state-wide scrub bull eradication campaign.

The relation of the hydrogen ion concentration to the titratable acidity of milk, P. F. SHARP and T. J. MCINERNEY (*Jour. Biol. Chem.*, 75 (1927), No. 1, pp. 177-184, figs. 2).—Samples of milk, some abnormal, were tested at the New York Cornell Station, and it was found that the titratable acidity ranged from 0.5 to 0.05 per cent expressed as lactic acid and the pH concentration from 6 to 7.73. Several of the abnormal samples were obtained from diseased udders, gargety milk, and from cows that had not been milked for some time. Determinations were usually made within two hours after milking. Samples showing abnormally high titratable acidity and pH concentration were all samples of colostrum milk or milk drawn during the first few days of lactation, but the latter were not always high in acidity. It was found that the pH concentration can be determined from the titratable acidity with an average error of ± 0.06 pH, if the titratable acidity is greater than 0.1 per cent. The relationship between the titratable acidity and pH of sour milk as compared with fresh milk is such that fresh milk which has a high acidity can generally be recog-

nized. This work has indicated that the determination of the pH of milk may be of great value in determining the condition of the acidity.

Why cream tests vary, D. R. THEOPHILUS (*Idaho Sta. Circ.* 50 (1927), pp. 3).—The author discusses in a popular manner some of the causes of variation in cream tests.

Sour cream for table uses, B. I. MASUROVSKY (*N. Y. Prod. Rev. and Amer. Creamery*, 64 (1927), No. 7, p. 236).—The author gives directions for the production of sour cream for table use for special trades. The requirements of the New York Health Department for such cream are also given.

Effect of temperature on the viscosity of skim milk, R. WHITAKER, J. M. SHERMAN, and P. F. SHARP (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 361-371, figs. 2).—Determinations were made with Ostwald viscometers at the New York Cornell Station of the effect of temperature on the viscosity of skim milk and whey. It was found that as the temperature increased from 5 to 60° C. the viscosity of skim milk decreased faster than that of water. From 60 to 70° the viscosity of both decreased at approximately the same rate, while above 70° the viscosity of skim milk decreased slower than that of water. Pasteurizing skim milk below 72° for 30 minutes caused a decrease in viscosity, while pasteurizing at higher temperatures caused an increase in viscosity. Pasteurizing whey for 30 minutes below 60° resulted in a decrease in viscosity, from 60 to 100° an increase, and from 100 to 120° a decrease. The density of skim milk decreases faster than that of water as the temperature rises from 5 to 40°, but from 40 to 80° they decrease at about the same rate.

Cheese, L. L. VAN SLYKE and W. V. PRICE (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench Trubner & Co.*, 1927, pp. VIII+364, figs. 73).—The five parts of this book deal with the composition of milk and its relation to cheese, biological relations of milk to cheese making, the operations of cheese making, the ripening of cheese, and miscellaneous subjects.

Soft cheese investigations, J. C. MARQUARDT (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 309-330).—Experiments have been conducted at the New York State Station to determine the best methods for manufacturing soft cheeses with a smooth texture and mild flavor. Homogenization and high pasteurization temperatures of the milk or cream were found to improve the quality of soft cheese. Homogenizing at 2,000 lbs. pressure or more is required, and this pressure reduces the fat losses in the whey. Homogenization at 4,000 lbs. or above further improves the texture, but does not reduce the fat losses more than the lower pressure. Milk should be homogenized at 130 to 140° F. to eliminate viscosity variations, and cream at 110° to produce a smooth texture. Excessive amounts of rennet produce a dry-appearing cheese. In using 1.5 to 20 cc. of rennet per 1,000 lbs. of milk to which a culture is added, a soft jelly-like curd is formed when set at 72° in 12 to 18 hours. Increasing the rennet to the maximum and the setting temperature to 86° produced the same curd in 4 to 6 hours. Ten to 25 cc. of commercial culture per 1,000 lbs. of milk is required to control flavors in soft cheese. The fat content of the milk or cream influences the texture and flavor, and pasteurizing at 145° and holding for 30 minutes improves the flavor and keeping quality. High pasteurizing temperatures cause heavy fat losses in the whey of unhomogenized cream.

Three methods for the manufacture of cream cheese are recommended by the author. The curd of the cream cheese should be cooled to a temperature of 50° and then drained under pressure. Salting was successfully accomplished before and after draining.

Some observations on the freezing points of various cheeses, P. D. WATSON and A. LEIGHTON (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 331-334, fig. 1).—The authors report findings of the freezing point of nine different kinds

of cheeses, determined by means of a thermocouple in work at the U. S. D' A. Bureau of Dairy Industry.

On the calculation of the freezing point of ice-cream mixes and of the quantities of ice separated during the freezing process, A. LEIGHTON (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 300-308, figs. 3).—In studies by the U. S. D. A. Bureau of Dairy Industry it has been found that the components of milk have a depressing effect upon the freezing point of the water in the milk. The freezing point of milk has a fairly constant value, which is 0.55° C. lower than that of water. By using the molecular weight formula it was determined that milk sugars account for 0.306° of the freezing point lowering of milk, and that 0.244° is caused by the combined action of milk salts, protein, fat, etc. Since the sugars do not obey the freezing point law, it is necessary to calculate the total sugar concentrations of an ice cream mix and refer to the actual freezing point curve for cane sugar solutions (E. S. R., 57, p. 769). Two assumptions not checked experimentally have been made in this study, "first, that the freezing-point depression caused by the salts obeys the freezing-point law, which is probably true because of the moderately concentrated solutions encountered; second, that mixtures of lactose and cane sugar, where lactose is present in moderate amounts, will closely follow the freezing-point curve of pure cane sugar in water solution."

The author presents a chart showing the quantities of ice separated from experimental mixes at different degrees. The quantity of ice that would be frozen in the mix at -4.5° is about 1 per cent, and due to the tendency of lactose to supersaturate there is little chance of its crystallizing in the freezer. From these facts it appears to the author that the materials supposedly thrown out in solid form do not have any great effect upon the accuracy of the calculations. In this work no reference is made to the effect of flavoring materials upon the freezing point of a mix, but if the water concentration, freezing point, and quantity of flavoring material added are known the effect may be calculated.

A graphical method of proportioning and standardizing ice cream mixes, W. V. PRICE (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 292-299, fig. 1).—The author presents and illustrates a graphic method of proportioning and standardizing ice cream mixes.

A manual for ice cream makers, C. D. DAHLE (*Atlanta, Ga.: Loyless Pub. Co.*, 1927, pp. [5]+158).—A treatise designed for the practical ice cream manufacturer, discussing the composition, ingredients, and flavors of the mix. Methods of manufacture, together with some common defects of the finished products, their causes, and means of correction, are pointed out. Formulas for ices, sherbets, and flavored ice creams and formulas using various ingredients to make mixes of different proportions are given. Appended are listed Federal and State regulations covering ice cream, together with tables of useful information.

Abstracts of literature on the manufacture and distribution of ice cream (*Harrisburg, Pa.: Internatl. Assoc. Ice Cream Manfrs.*, 1927, vol. 1, pp. [2]+IX+139+II+47, figs. 4).—The first of a series of compilations, reproduced by a special process of typewriting, of abstracts of the literature concerning ice cream. Appended is a series of practical facts and statistics for the ice cream manufacturer.

VETERINARY MEDICINE

[Report of the] division of animal industry, J. P. IVERSON (*Calif. Dept. Agr. Mo. Bul.*, 15 (1926), No. 7-12, pp. 169-193).—This report includes an account of the occurrence of and control work with infectious and parasitic diseases of livestock.

Report of the parasitologist, G. DIKMANN (*Porto Rico Sta. Rpt. 1926, pp. 30, 31*).—In an examination made of domestic animals, chickens and guinea hens showed a high rate of infestation with roundworms, and chickens at times harbored numerous tapeworms or small numbers of flukes. Two flukes of the genus *Prosthogonimus* were found to parasitize a duck examined. The mon-goose appeared to be free from such parasitic infestation. Reports of infestation of baby chicks with the sticktight flea were received, this pest being widely distributed over the island. Reference is made to infestation of cattle with lice, a goat with lice and ticks, and a horse with the scab mite.

Examination of disinfectants, G. F. REDDISH (*Amer. Jour. Pub. Health, 17 (1927), No. 4, pp. 320-329*).—This is a contribution from the U. S. D. A. Bureau of Chemistry in which a new method for testing the germicidal efficiency of disinfectants and antiseptics is proposed. The test is based on the well-known technique of the Rideal-Walker and Hygienic Laboratory methods, retaining the best features of both these tests and eliminating the most objectionable. Instead of using only one test organism, as specified in the Rideal-Walker (E. S. R., 45, p. 807) and Hygienic Laboratory⁴ methods, it is recommended that representatives of the most important groups of pathogens be used in a simplified method. Detailed procedures are given for *Bacillus typhosus* and *Staphylococcus aureus*, and tentative methods are outlined for *B. diphtheriae*, *B. tuberculosis*, the pneumococcus and *Streptococcus hemolyticus*. A standard of resistance to phenol for each of these organisms, with the exception of *B. tuberculosis*, is given, and it is stated that when they are used for testing the germicidal powers of disinfectants and antiseptics they should show the resistance to phenol here indicated.

A new germicide (*Science, 66 (1927), No. 1716, p. X*).—A brief account is given of a liquid germicide known as S. T. 37, developed by V. Leonard and W. A. Feirer of the Johns Hopkins School of Hygiene and Public Health, which has the selective capacity of killing even the most resistant bacteria in 15 seconds without injuring the most delicate tissues. The active agent is hexyl-resorcinol, a synthetic product, harmless to man, but possessing over 70 times the germ-killing power of pure carbolic acid.

Cedar oil as an aid in finding parasitic ova in feces, G. E. HEIN (*Jour. Lab. and Clin. Med., 12 (1927), No. 11, pp. 1117, 1118, figs. 2*).—A method is described which depends upon the property of cedar oil in clarifying smears of dried feces so that very thick smears may be utilized in looking for ova with greatly increased probability of finding them. An extremely thick smear of the suspected feces is made upon a slide and allowed to dry at room temperature, the thickness of the smear being from 5 to 10 times as heavy as ordinarily used. Cedar oil is dropped upon the field and covered with a cover glass. The feces are rendered transparent, and ova are greatly accentuated by the clear background. The slides may be kept for some time, the author having ova of *Trichocephalus trichiurus* which were unchanged after three years.

Are *Ascaris lumbricoides* and *Ascaris suilla* identical? F. C. and E. L. CALDWELL (*Jour. Parasitol., 13 (1926), No. 2, pp. 141-145*).—The authors report upon a survey made in Alabama in which epidemiological evidence was obtained indicating that the pig and human *Ascaris* are not identical. In an area in which the incidence of *Ascaris* infestation of pigs was 46.5 per cent and in which all factors seemed to be favorable for cross infestation between pig and man the incidence of human *Ascaris* was less than 1 per cent.

⁴ U. S. Pub. Health Serv., Hyg. Lab. Bul. 82 (1912).

Studies on the serologic classification of *B. botulinus*, II-IV (*Jour. Immunol.*, 10 (1925), No. 1, pp. 1-53, figs. 4; 13 (1927), Nos. 2, pp. 79-92, figs. 4; 3, pp. 237-241).—The following papers are in continuation of the account previously noted (*E. S. R.*, 51, p. 180):

II. *Agglutination*, P. Schoenholz and K. F. Meyer.—The authors' serological study of 104 strains of *Bacillus botulinus* types A and B by means of agglutination and absorption tests indicates that these types may be subdivided into at least seven groups. Their toxicological and serological reactions agree, with one exception.

III. *The complement fixation reaction*, J. B. Gunnison and P. Schoenholz.—The authors find the complement fixation test to be highly specific for the two types of *B. botulinus* and for the subgroups as previously determined by the agglutination reaction. Inagglutinable strains may be assigned to their proper group by means of this test.

IV. *The precipitin reaction*, J. B. Gunnison and P. Schoenholz.—The results obtained by the application of the precipitin test to the serologic classification of *B. botulinus* agree closely with those previously obtained by means of the agglutination and complement fixation reactions. The precipitin test is highly specific for the two types of *B. botulinus* and for the subgroups within those types.

The incidence of carriers of *B. aertrycke* (*B. pestis caviae*) and *B. enteritidis* in wild rats of San Francisco, K. F. MEYER and K. MATSUMURA (*Jour. Infect. Diseases*, 41 (1927), No. 5, pp. 395-404).—In order to determine the existence and incidence of rodent typhoid in the rat population of San Francisco, a bacteriological examination was made of 775 rats (*Mus norvegicus*, *deomanus*, and *rattus*), of which 58 were found infected either with *Bacillus enteritidis* (28 cases) or *B. aertrycke* (30 cases). This record is said to be the first published on the occurrence of *B. aertrycke* in wild rats.

At least 17 of the rodents harbored the specific organisms in the intestinal tube and were capable of shedding highly virulent bacilli into the feces. Only two-thirds of the infected rats exhibited lesions in the liver and spleen which might be considered the naked-eye signs of a preceding infection. Since the animals came from districts in which no rat virus baits had been scattered, it is held to be clear that they derived the paratyphoid-enteritidis bacilli from natural infection. The carrier rate was fairly uniform throughout the city, and was approximately 6 per cent in the vicinity of the slaughter houses, retail, and second class residential districts. It is believed not unlikely that the conditions found in San Francisco are typical for a city with a vigilant rat extermination service, but should not be considered as representative of the prevalence of rat typhoid in other large communities.

Laboratory procedures for the diagnosis of undulant (Malta) fever, A. C. EVANS (*Amer. Jour. Pub. Health*, 17 (1927), No. 4, pp. 399-403).—The technique employed in the diagnosis of this disease is described.

Tick-fever due to *Piroplasma gibsoni* Patton in a kennel of foxhounds in India, T. H. SYMONS (*Indian Jour. Med. Research*, 14 (1926), No. 2, pp. 293-315, figs. 9; also in *Indian Vet. Jour.*, 4 (1928), No. 3, pp. 260-282).—A detailed report of an outbreak of this disease in foxhounds.

Bovine piroplasmosis (red-water) in Great Britain, L. E. W. BEVAN (*Vet. Rec.*, 7 (1927), No. 50, pp. 1088-1090, fig. 1).—In this discussion the author points out that in South Africa trypanblue is very effective when used against *Piroplasma bigeminum*, in numerous cases animals almost at the point of death having completely recovered within a few hours after its injection. Temperature charts are given of cases illustrating the rapid drop that immediately

follows its injection. It is pointed out that *P. divergens*, which occurs in Great Britain, may be more resistant to trypanblue.

Rinderpest control in Kenya, H. H. BRASSEY-EDWARDS (*Vet. Rec.*, 7 (1927), No. 49, pp. 1063-1066).—This is a report on the control work conducted in Kenya Colony, particularly since 1920.

Preparation of Salmonella pullorum antigens for complement fixation tests, L. D. BUSHNELL and C. B. HUDSON (*Jour. Infect. Diseases*, 41 (1927), No. 5, pp. 383-387).—This contribution from the Kansas Experiment Station describes a method of preparing antigens that has given a satisfactory product for use for the complement fixation test. The cell suspension washed carefully with ether is satisfactory in its antigenic action and is not anticomplementary, but causes a turbidity which makes tests difficult to read. The salt solution washings of the bacterial cells are antigenic and not anticomplementary after the second treatment. A very vigorous washing is necessary to cause strong dissociation of this product. An unfiltered medium containing sodium citrate gives a more luxuriant growth than a medium which has been filtered. The citrate salt holds the phosphates in solution during sterilization.

Complement fixation and agglutination tests for Salmonella pullorum infection, L. D. BUSHNELL and C. B. HUDSON (*Jour. Infect. Diseases*, 41 (1927), No. 5, pp. 388-394).—This is a contribution from the Kansas Experiment Station, reporting experiments in which it was found that a highly antigenic substance may be separated from the cells of *S. pullorum* by washing with a salt solution. This substance is soluble in salt solution and is thermostable, and does not act freely in complement-fixing tests unless it is separated from the cells. All cultures of the organisms are not equally rich in this substance. The complement fixation and agglutination tests have about the same value in testing for carriers of *S. pullorum*. A combination of the two tests is more decisive, leaving a smaller number of questionable cases. The complement-fixing test can not be used with low dilutions of serum, and is of no special value in detecting actual carriers of the organisms.

The standardization of tuberculin, C. C. OKELL and H. J. PARISH (*Brit. Jour. Expt. Path.*, 8 (1927), No. 3, pp. 170-175, figs. 2).—The intradermic test was found to be more accurate than the subcutaneous or Von Pirquet methods, differences representing a 40 per cent drop being almost always detectable on a small series, and finer differences on a larger series of guinea pigs. The test, however, calls for considerable experience. The subcutaneous test will also show differences of 40 to 50 per cent if a sufficient number of suitable guinea pigs is used, but the cost in guinea pigs of attaining a given degree of accuracy is much greater than with the intradermic test. Its one advantage is that there is practically no personal factor in its interpretation. The Von Pirquet test in guinea pigs is very inaccurate, and gross errors are often made. It is deemed practically useless as a method of standardizing tuberculin.

Microscopic changes of tularaemia in the tick Dermacentor andersoni and the bedbug Cimex lectularius, E. FRANCIS (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 45, pp. 2763-2772, pls. 4, figs. 2).—Part 1 (pp. 2763-2767) of this account deals with the changes which take place in this tick, and part 2 (pp. 2767-2772) with those occurring in the bedbug. The methods used (1) in immobilizing a tick for dissection by the use of adhesive plaster fastened to a block of wood with thumb tacks and (2) in immobilizing a mouse when feeding the bugs upon its tail are described and illustrated.

A rapid method for the macroscopic agglutination test, A. NOBLE (*Jour. Bact.*, 14 (1927), No. 5, pp. 287-300).—A rapid method for macroscopic agglutination is described in which the reactions are sharp and well defined and check with those given by a standard 18-hour method. The method involves concen-

tration of the antigen, the use of small amounts of both antigen and serum, and thorough mixing. Results read within 5 minutes after adding serum to suspension correspond to those obtained by a standard method requiring from 18 to 24 hours. Either killed standardized suspensions or live cultures may be used and, on account of the rapidity of the reaction, suspensions of organisms which tend to settle out on standing give good results. In animal immunization work the serum titer can be determined at the exact point desired. The rapidity of the reaction is of practical value in making possible the repetition of tests and variation of conditions for both diagnostic and research purposes.

A rapid method perfected by Huddleson and Carlson for the diagnosis of infectious abortion has been noted (E. S. R., 57, p. 672), as has an adaptation for the diagnosis of bacillary white diarrhea of the fowl by Runnells, Coon, Farley, and Thorp (E. S. R., 57, p. 774).

The abortoscope method of applying the agglutination test, L. E. W. BEVAN (*Vet. Rec.*, 7 (1927), No. 50, pp. 1096-1098).—In this discussion the author presents a table showing the comparative results of agglutination tests of 37 cows by the abortoscope and laboratory methods. It is pointed out that "the abortoscope is merely the agglutination test rendered so simple that it can be applied by the 'man on the spot' without reference to the laboratory. The contents of the bottle are a suspension of *B. abortus* in a solution which permits of the test being carried out with the whole blood, and thus obviating the necessity of separating the serum from the clot. Its particular virtue lies in the metallic loop, which enables the blood to be collected easily and in a few minutes instead of in the old crude manner hitherto adopted. The method has the advantage over the old laboratory method in that the test can be carried out with fresh blood, and the delay in forwarding the blood to the laboratory, during which putrefactive and other changes which may vitiate the test may and frequently do occur, is avoided."

The blood-sugar of the cow in milk fever, R. GREIG (*Vet. Rec.*, 7 (1927), No. 47, pp. 1017, 1018).—The author reviews the status of knowledge of the subject, referring to the contributions of Fish and Hayden (E. S. R., 57, p. 874), Hayden and Sholl (E. S. R., 55, p. 371), Widmark and Carlens,⁶ and others.

The segregation of lambs at birth and the feeding of cow's milk in the elimination of parasites, T. SMITH and E. R. RING (*Jour. Parasitol.*, 13 (1927), No. 4, pp. 260-269).—This is a report of experiments conducted with a view to learning the significance of colostrum to the newborn lamb. The work, which extended over three consecutive years, is considered to indicate plainly that colostrum and ewe's milk may be dispensed with without bringing about any noteworthy injury or deterioration of the offspring. It is pointed out that the presence of one or more enzootic infectious diseases in any flock may demand the use of colostrum for the initial protection of the newborn. The growth of the lambs fed on cow's milk was slightly retarded during the early months as compared with the lambs left with their dams, but when placed in the outdoor inclosures they rapidly overtook the control group.

On the treatment of distomiasis of sheep with Distol, Serapis, Filinol, and Parazitin [trans. title], M. P. GROZA (*Arch. Vet.*, 20 (1927), No. 1-2, pp. 3-53, figs. 3; *Fr. abs.*, pp. 51, 52).—The experimental work here reported indicates that Distol is nontoxic, has no ill effect on the animal, and destroys the liver fluke *Fasciola hepatica* after several days without producing abortion in gestating ewes. A total of 351 sheep were thus treated with but a single death, and this was probably due to the animal's being in an advanced stage of the disease when the treatment was administered. The alarming symptoms of the

⁶ *Biochem. Ztschr.*, 156 (1925), No. 5-6, pp. 454-459.

disease disappear after several days and general improvement rapidly follows. This chemical apparently has no effect upon *Dicrocoelium lanceatum*.

The other materials used are apparently of less value than Distol in the treatment of the liver fluke, and none had any beneficial influence upon *D. lanceatum*, with the possible exception of Seraplis Sb 444.

A list of 23 references to the literature is included.

Nodular lesions in the spleen of swine caused by Actinomyces infection, G. T. CREECH (*Jour. Agr. Research* [U. S.], 35 (1927), No. 9, pp. 835-841, pls. 6).—The finding by Federal meat inspectors from time to time of isolated cases of nodular lesions of the spleens of swine in which no lesions were observed in other organs or tissues led to the investigation here reported. The observations extended over a period of several years during which time at least 50 typical specimens of nodular spleens were received, most of which were examined histologically and about one-half of the number were cultured.

The nodules in the different spleens varied considerably in size, some being a little larger than the head of a pin while others attained the size of a hazelnut. More frequently they were about the size of a pea or a little larger. The more superficial nodules were usually slightly elevated above the surface of the organ. While on casual observation the nodular lesions in the gross specimen are somewhat suggestive of tuberculosis, a more minute examination reveals a rather distinct difference. The spleen does not show the extensive fibrous changes seen in tuberculosis.

Sections of affected spleens showed the lesions to consist of necrotic centers, varying in size and usually heavily encapsulated. The necrotic centers were surrounded by zones of round cells, epithelioid cells, and leucocytes. The degenerated centers of the nodules were frequently seen to be undergoing calcification. In most cases little change was noted in the splenic tissue outside of the encapsulated areas. The actinomyces were definitely demonstrated in seven different specimens, or 14 per cent of the spleens examined. When the red-staining bodies were first observed in the swine spleens it was noted that they did not appear to be altogether typical of *A. bovis*. It is now believed that the slight morphological variations noted were the result of degenerative changes, since somewhat similar alterations have been observed in the organisms in cases of actinomyces infection of bovine tissues.

The finding of *A. bovis* in the absence of other possible causative organisms has led to the conclusion that it is the cause of the splenic lesions. It is thought that the pigs probably become infected early in life, and that they are quite resistant to such splenic infections. The evidence at hand points to the stomach as the most probable point of entry through which the organism eventually reaches the spleen.

The relation of calcium to the toxicity of carbon tetrachloride in dogs, A. S. MINOR (*Soc. Expt. Biol. and Med. Proc.*, 24 (1927), No. 6, pp. 617-620).—This report is one of a series of studies on the pharmacology and toxicology of carbon tetrachloride carried on with the support of the International Health Board. The work conducted shows that carbon tetrachloride is relatively very toxic for dogs that have been on a prolonged low calcium diet, and that signs of intoxication can be prevented by the continued addition of calcium to the diet or cured by either the intravenous injection of calcium chloride or the oral administration of ammonium chloride.

Some notes on poultry diseases, C. G. SAUNDERS (*Vet. Jour.*, 83 (1927), No. 630, pp. 602-606).—These notes relate particularly to coccidiosis, bacillary white diarrhea, tuberculosis, and digestive trouble.

Bacillary white diarrhoea of chicks (B. W. D.), T. DALLING, J. H. MASON, W. S. GORDON (*Vet. Jour.*, 83 (1927), No. 629, 555-565).—This is a report of

investigations conducted at the Wellcome Physiological Research Laboratories on several phases of the problem.

In the experiments, fowls up to one year of age were infected by feeding large doses of *Bacterium pullorum* broth culture. It was found that deaths may occur soon after infection, or hens may live for months when *B. pullorum* may be isolated from the ovary.

"Nonreacting cockerels may be made to react to the agglutination test by intravenous or intratesticular injections of *B. pullorum*. Such cockerels do not appear to transmit infection to hens mated with them. Natural and artificially infected hens do not appear to transmit infection to normal hens in the same pens or chicks bred from clean stock when placed in contact. A clean cockerel mated with infected and clean hens does not appear to cause infection of the clean stock.

"A considerable variation in the agglutination titer of fowls' serum may occur from time to time, and there is evidence that a strongly positive hen whose ovary contains *B. pullorum* may at times show a negative agglutination reaction. Various methods of making antigens for use in agglutination tests have been the subject of experiment. *B. pullorum* was recovered from about 4 per cent of the eggs laid by natural and artificial 'carrier' hens. Attempts to cause *B. pullorum* to pass through the shells of eggs were unsuccessful. Gas-producing strains of *B. pullorum* may lose this quality in the laboratory."

The authors were unable to differentiate *B. pullorum* and *B. gallinarum* by the agglutination test. It is concluded that hyperimmune serum may be useful in hatches of chicks in which a light infection of bacillary white diarrhea is present.

Details of the experiments are reported in appended tables.

Employment of a double sugar medium for routine diagnosis of bacillary white diarrhea, fowl typhoid, and fowl cholera, G. A. CRUICKSHANK (*Jour. Bact.*, 14 (1927), No. 6, pp. 435-439).—In this contribution from the Rhode Island Experiment Station the author describes a method for the routine differentiation of bacillary white diarrhea, fowl typhoid, and fowl cholera by which the cost of material and labor is considerably reduced. It consists in the inoculation of Gram-negative nonspore-forming rods which do not ferment lactose into a medium containing 0.1 per cent glucose and 0.5 per cent maltose. A tube of 1 per cent sucrose broth serves to detect the organism of fowl cholera. This method requires about one-half the number of transfers usually employed, and slightly less time is consumed in making a diagnosis. In nearly 200 controlled tests with known and unknown cultures the method gave clear-cut reactions.

The immunization of fowls against chicken-pox (Epithelioma contagiosum) by subcutaneous injection of virus, J. R. BEACH (*Hilgardia [California Sta.]*, 3 (1927), No. 3, pp. 41-97, figs. 3).—In this paper the author presents the results of a series of experiments in the immunization of fowls against chicken pox by the subcutaneous injection of vaccine prepared by mixing finely ground fresh tissue obtained from cockerels with pronounced comb infection of chicken pox with a suitable liquid diluent. In the course of the study approximately 1,000 birds were kept under laboratory conditions and 14,000 birds on poultry farms were utilized. Following a brief introduction and a discussion of methods employed, details of the work are given under the headings of experiments with vaccines prepared from whole combs; whole combs, blood, and organs; the lesions of the comb and from the blood and organs; and lesion tissue. Many of the details are presented in tabular form.

In the preparation of the vaccine the liver, spleen, kidneys, and blood in some cases were added to the other tissues, but the lesion and sublesion epithelial

tissue alone appeared to be the more satisfactory. As a diluent or vehicle and preservative for the tissue, either 0.5 per cent phenolized physiologic salt solution or a mixture of equal parts of glycerine and 1 per cent phenolized physiologic salt solution was used, the latter seeming to be preferable. It was found that a vaccine prepared from lesions and sublesion epithelial tissue and a mixture of equal parts of glycerine and 1 per cent phenolized physiologic saline is capable of producing either complete immunity or a high degree of resistance to artificial infection with chicken pox virus within 28 days, which lasts for at least as long as 275 days. The data, however, are insufficient to permit conclusions regarding the percentage of vaccinated fowls that will remain completely immunized for such a long period after vaccination. The immunizing value of the vaccine has been shown to depend upon and to vary according to the amount and virulence of the virus it contains.

The results have demonstrated that attenuation of the virus is not necessary to make the vaccine safe for use. Slight attenuation does not injure the immunizing value of the vaccine and may make more remote the possibility of harmful chicken pox lesions resulting from the subcutaneous injection. This attenuation may be accomplished by aging the vaccine for a short period, and it also serves to destroy contaminating bacteria. The length of time that the virus in vaccine of 0.1 or 0.25 gm. per cubic centimeter withstood aging without too great attenuation varied from 50 to 140 days. In vaccines containing 0.01 gm. or less of tissue in a cubic centimeter, however, the virus was entirely destroyed in less than 40 days. The amount of tissue in an immunizing dose of vaccine may vary within wide limits, that used most extensively in these experiments and which gave satisfactory results being 0.002 gm. The subcutaneous injection of vaccine containing an abundance of virulent virus is usually followed by the development of a chicken pox lesion at the point of injection, but such lesions do not spread to other parts of the body nor otherwise become harmful.

The vaccine may be administered to fowls in flocks in which an outbreak of chicken pox exists without increasing the severity of the lesions in fowls already infected or hastening the spread of the infection among healthy fowls. Vaccination of such flocks should result in control of the outbreak within 28 days. Flocks of healthy young fowls from 4 to 7 months old can be vaccinated for the purpose of immunizing them against subsequent infection without danger of inducing harmful chicken pox infection among them. In such cases, however, all of the susceptible fowls on the premises must be vaccinated. It is pointed out that it would be unwise to use vaccine on a poultry farm on which chicken pox had never existed unless it was so situated that chicken pox virus was likely to be introduced on it at any time. The data obtained in these experiments are not deemed sufficient to prove definitely that when young fowls are vaccinated during the summer and fall they will be protected against chicken pox infection during the following winter and spring, but they do suggest that such may be the case.

Studies in fowl typhoid, T. KONNO ([Chosen] Govt. Inst. Vet. Research Rpt., 4 (1927), Eng. abs., pp. 47-50).—The author reports that fowl typhoid has appeared in Chosen (Korea) twelve times since the first outbreak in 1921, being now quite widespread from the southernmost island of Saishu to the northern boundaries. Both vaccine and immune serum were proved to be effective when used as a prophylactic, and immune serum was effective therapeutically for slight cases or in the early stage of the disease. Its practical application was very successful. Reference is also made to an infectious disease of guinea pigs caused by Gaertner's bacillus and to an enzootic in Korean cattle caused by a bacillus of the enteritidis group.

Effect of parasitism on fowl thymi, J. E. ACKERT (*Anat. Rec.*, 29 (1924), No. 2, p. 120).—The author's studies of the parasite *Ascaridia perspicillum* in chickens indicate that the thymi of parasitized birds are smaller than those of nonparasitized (E. S. R., 56, p. 875).

Studies on the resistance of the chicken to the nematode *Ascaridia perspicillum*, C. A. HERRICK (*Amer. Jour. Hyg.*, 6 (1926), No. 1, pp. 153-172, fig. 1).—The studies indicate that as chickens increase in age they become more resistant to the development of *A. perspicillum*. The parasites developing in resistant chickens were more variable in size than those developing in hosts with low resistance. Parasites in chickens over 100 days old were not able to make a growth of over 0.1 mm. during the first 10 days, while those in 5-day-old hosts made a growth of over 5 mm. Parasites in heavily infested chickens made less growth than in lightly infested hosts. Although parasites could be transferred from old to young hosts, they could not be changed from one old host to another. This suggests that they become specifically adjusted to their host. Thymectomy and the prevention of the flow of bile into the intestine had no effect on the growth of the parasites. The serum of one cockerel, when injected into young chickens, was effective in making them more resistant to parasitism. Young chickens, when injected with other adult chicken serum, were less affected by the parasites, but were no more resistant to their growth. The removal of large amounts of blood from adult chickens by cardiac puncture made them less resistant to the growth of parasites.

A new nematode of the rabbit, B. L. DANHEIM (*Anat. Rec.*, 29 (1924), No. 2, p. 124).—Examinations made of 70 common wild rabbits (*Lepus floridans mearnsi* Allen) in the vicinity of Manhattan, Kans., resulted in the collection of 1,000 small nematodes from each of three of the rabbits, studies of which showed them to be *Oxyuris evoluta* Linst. reported from the porcupine. It is said to be a new host record for this parasite.

The important diseases of rabbits, particularly infectious and parasitic diseases [trans. title], O. SEIFRIED (*Ergeb. Allg. Path. Mensch. u. Tiere*, 22 (1927), pt. 1, pp. 432-589, figs. 54).—The first part of this review deals with the infectious diseases (pp. 432-533), the second part (pp. 533-572) with parasitic diseases, the third part (pp. 572-575) with tumors, the fourth part (pp. 575, 576) with poisoning, and the fifth part (pp. 576-589) with sporadic diseases. Copious lists of references accompany the accounts.

AGRICULTURAL ENGINEERING

The use and duty of water in the Salt River Valley, J. C. MARR (*Arizona Sta. Bul.* 120 (1927), pp. 55-97, figs. 13).—Investigations conducted in cooperation with the U. S. D. A. Bureau of Public Roads are reported, together with a preface by G. E. P. Smith.

The average gross duty of water for the Salt River Valley is approximately 5.25 acre-ft. per annum, and the net duty for all crops, as charged, is about 3 acre-ft. The difference consists of seepage and evaporation losses, water wasted in the operation of canals, and over-delivery. Alfalfa yields have been found to increase with the application of water up to a depth of 7 ft. per season, but a depth of 4 ft. is considered to be the safe quantity to use from the standpoint of protection from water-logging.

The results of observations on a limited number of cotton fields indicated that the yield increased with an increase in the water applied up to a total of 2.25 to 2.5 acre-ft. per annum. The yield of sugar cane increased with the total annual depth of water applied up to more than 4 acre-ft. The quantity

of water which should be used to irrigate small grain in this section has been found to vary from 1.4 to 1.8 acre-ft. per acre per season. Grain sorghum should receive from 0.75 to 1.3 acre-ft. of water per acre per season.

It has been found that border strips or furrows on the average soil of the valley should not be longer than 0.25 mile and under some conditions should be much shorter.

Weirs for measuring small irrigating streams, G. E. P. SMITH (*Arizona Sta. Timely Hints for Farmers*, No. 157 (1927), pp. 11, figs. 5).—Practical information on the construction of weirs for measuring small irrigating streams is presented.

Cameron hydraulic data (*New York: Ingersoll-Rand Co.*, 1926, 6. ed., pp. [8]+69+[17], figs. 28).—This is the sixth edition of this book of hydraulic engineering data.

The effect of growth upon the capacity of drainage ditches, C. E. RAMSER (*Agr. Engin.*, 8 (1927), No. 7, pp. 177–180, figs. 17).—In a contribution from the U. S. D. A. Bureau of Public Roads the results of field measurements on channels in the States of Missouri, Mississippi, Arkansas, and Illinois, to show the relative capacity of cleared and uncleared channels are reported. These indicate conclusively that the usefulness of a drainage channel is greatly impaired by the growth of vegetation. Vegetation in a ditch often causes appreciable silting, which sometimes requires the redredging of the ditch at great expense as compared with the smaller cost of systematic maintenance.

Factors influencing soil moisture regulation.—II, Soil moisture losses and factors in prevention, R. W. TEULLINGER (*Agr. Engin.*, 8 (1927), No. 7, pp. 183–186, 193).—In a second contribution from the U. S. D. A. Office of Experiment Stations (E. S. R., 57, p. 880), an analytical summary of work relating to soil moisture losses and factors in their prevention is presented.

The results appear to indicate that practically the same internal and external factors which influence the manner of occurrence, absorption, and retention of moisture in soils also have some bearing on the nature and extent of the losses of moisture from soils by gravity and evaporation. This seems to be especially indicated by the results of investigations of mulching and cultivation practices. A bibliography of 45 references to literature bearing on the subject is included.

Reinforced concrete construction.—Volume I, Fundamental principles, G. A. HOOL (*New York and London: McGraw-Hill Book Co.*, 1927, 3. ed., pp. XII+380, figs. 171).—This is the third edition of this book (E. S. R., 42, p. 685), which lays down the fundamental principles of reinforced concrete design and construction and includes numerous tables and diagrams for use in calculation and design.

Research on wood preservatives, H. T. BARR (*Agr. Engin.*, 8 (1927), No. 7, p. 176, fig. 1).—In a contribution from the Arkansas Experiment Station a brief description is given of the project in progress on the durability of fence posts and methods of preservative treatment. A progress report of the results of this project is also given. The purpose of this statement is to show an example of the organization and operation of research work in the subject.

Public Roads, [December, 1927] (*U. S. Dept. Agr., Public Roads*, 8 (1927), No. 10, pp. 215–230+[1], figs. 21).—This number of this periodical contains the status of Federal-aid highway construction as of November 30, 1927, together with the following articles: Digest of Vermont Highway Transportation Survey by J. G. McKay (pp. 215–224, 229); Relation Between Sodium Sulphate Soundness Test and Absorption of Sedimentary Rock, by D. O. Woolf, jr. (pp. 225–229, 229); Instrument Developed for Measuring Length of Cracks in Concrete, by H. L. Bosley (pp. 228, 229); and Yadkin River Bridge Test Completed (p. 230).

Kinematics and dynamics of the wheel-type farm tractor, I-VII, E. G. McKIBBEN (*Agr. Engin.*, 8 (1927), Nos. 1, pp. 15, 16, fig. 1; 2, pp. 39, 40, figs. 11; 3, pp. 58-60, figs. 2; 4, pp. 90-93, figs. 4; 5, pp. 119-122, figs. 11; 6, pp. 155-160, figs. 7; 7, pp. 187-189, figs. 6).—This analysis, based on studies conducted at the California Experiment Station, indicates that except when turning to the right or left the motion of a tractor consists of linear motion parallel to the motion of the center of the rear axle, rotation about the rear axle, or a combination of these motions. The above motions may be considered as rotation about an instantaneous axis which is parallel to the rear axle, and which lies somewhere in the plane which contains the center of the rear axle and which is perpendicular to the motion of the center of the rear axle. The center of gravity of a given tractor may be located by determining the weight supported by the front and rear wheels for different angles of the wheel base with the horizontal.

The important external forces which may act upon a tractor are its weight, soil reactions, load resistance, inertia, and wind resistance. The soil reactions may be divided into tractive, downward, supporting, and resisting components. The inertia effects due to both angular and linear acceleration may be represented by two inertia forces acting through the center of gravity and two inertia couples. The force of inertia due to the sudden starting of a tractor may, under certain conditions, be very large and thus bear an important relation to the stability of the tractor. Thus under certain conditions the sudden engagement of the clutch not only throws a great strain upon the transmission parts but may also dangerously disturb the stability of the tractor. Except under very unusual conditions the moment due to the gyroscopic action of the flywheel does not have an important effect upon the stability of the tractor.

In setting up the moment equation of the external forces acting upon a tractor any axis parallel to the rear axle may be assumed as the axis of rotation, but the line through the intersection of the resultant of the supporting soil reactions against the rear wheels and the resultant of the tractive soil reactions against the drivewheels is the most convenient and results in the simplest equation. The overturning moment due to the load resistance is equal to the load resistance times the perpendicular distance from the intersection of the resultant of the supporting soil reactions against the rear wheels and the resultant of the tractive soil reactions against the drivewheels to the line of action of the load resistance.

The exact location of the intersection of the resultants of the supporting and tractive soil reactions is affected by the tractor, soil, load, and speed, is constantly changing within certain limits, and for many soil conditions is one of the unknown factors of soil traction dynamics. The load resistance moment arm should be as short as possible and still maintain the required drawbar clearance. From the standpoint of stability, it would be ideal if the lines of action of the load resistance and the resultant of the tractive soil reactions against the drivewheels could coincide and pass through the center of gravity.

Changing the height of the point of hitch to the implement, the length of the hitch, and the location with respect to the rear axle of the point of hitch to the tractor all affect the rate of change of the moment arm of the load resistance as the tractor rises in front, and in many cases affects the actual length of the load resistance moment arm before the tractor starts to rise in front. All of these factors thus affect the potential stability of the tractor.

Under usual operating conditions, raising the point of hitch to the implement, shortening the hitch, lowering the point of hitch to the tractor, or moving the point of hitch to the tractor to the rear increases the potential stability of the tractor.

Under conditions of uniform motion, if the tractor is to be operated only on level ground, the center of gravity should be as low as possible with respect to the rear axle and still maintain the required clearance between the frame and soil. On grades the center of gravity should be as low as possible with respect to the soil surface and still maintain the desired clearance. The greatest clearance for a given position of the center of gravity or the lowest position of the center of gravity for a given clearance is obtained with the material of the tractor outside of the wheels spread evenly over the entire width and length of the tractor with the least possible vertical thickness.

The distance of the center of gravity in front of the rear axle should be such as to leave just sufficient effective weight at the front wheels to enable satisfactory steering when the tractor is operating with the most probable hitch height and developing its rated drawbar pull in low gear.

Drivewheels should have as small a moment of inertia as possible and still maintain the required strength, durability, and dimensions, and the parts of a tractor should so far as possible be allowed to give the maximum moment of inertia about the rear axle. The stability of a tractor, the drivewheels of which have started to dig in, may be dangerously disturbed by placing a timber or other object giving positive traction under the points of the lugs. The danger is increased if the tractor is on an upgrade, if the length of the lugs is increased, and, in many cases, if the drawbar load has been disconnected.

From the standpoint of maximum ability and tractive ability the wheel base should be as long as possible and still permit a satisfactory turning radius and ability to cross checks or ridges. Unless the implement is designed for the given tractor and soil conditions, the positions of hitch points to both implement and tractor and the length of the hitch should be adjustable. The gear ratio, engine torque, and hitch adjustment of a tractor should be such that when operating under average conditions tractive ability will be the factor which limits the maximum drawbar pull. The increase in the drawbar pull parallel to the direction of motion of the center of the rear axle of the tractor, caused by the sudden stopping of the implement, is proportional to the weight of the tractor and the square of the speed of the tractor, and inversely proportional to the distance in which the tractor is stopped.

These results are taken to indicate that the design of a tractor is largely a matter of compromise. For example, the greatest possible clearance between all parts of the frame and the soil is very desirable. However, a large clearance means a high drawbar and a high center of gravity, both of which are undesirable. Thus if the designer is to make a wise compromise he must have a clear understanding of all factors involved, including the specific working conditions under which the tractor is to be used.

Movable hog houses, W. A. FOSTER and W. E. CARROLL (*Illinois Sta. Cir.* 320 (1927), pp. 20, figs. 30).—Suggestions relating to the planning and construction of movable hog houses are given, together with working drawings and bills of material.

Rabbit-house construction (*U. S. Dept. Agr. Leaflet 15* (1927), pp. [1]+6, figs. 5).—This leaflet contains working plans and bills of material for the construction of rabbit shelters.

Testing the efficiency of gas-fired warm-air furnaces, G. B. SHAWN (*Heating and Ventilating Mag.*, 24 (1927), No. 10, pp. 65, 66, 74, figs. 2).—A new method of testing the efficiency of gas-fired warm-air furnaces developed at the testing laboratory of the American Gas Association is described and discussed. It presents the advantage of greater accuracy in measurement of air and heat output.

Stream pollution in Wisconsin (*Madison: Wis. State Bd. Health, 1927, pp. XVIII+328, figs. 86*).—This is a joint report of the Conservation Commission and the State Board of Health of Wisconsin concerning their activities in the control of stream pollution from July 1, 1925, to December 31, 1926.

The data reported indicate that the discharge of industrial waste into certain streams is the only practical method of ultimate disposal in many cases and constitutes a necessary and proper use of the stream, provided the dilution is so great that there is no menace to public health nor material interference with the natural aquatic life of the stream.

Nearly all wastes cause reduction of the dissolved oxygen of the stream, and industrial wastes generally have a greater oxygen demand than domestic sewage. Biological oxidation is more rapid during warm weather than during cold weather, so that the oxygen demand of the waste is greater although the actual amount of oxygen available is less, since warm water retains less oxygen in solution. When the dissolved oxygen of a stream is depleted, green plants and other grasses of aerobic life die and anaerobic organisms such as worms and lower animal life prevail. A stream tends to purify itself by natural processes and will ultimately return practically to normal if the concentration of the wastes is not too great.

The results of an experimental investigation concerning the efficiency and practicability of chemical treatment in removing substances from pea cannery wastes that cause local nuisances and objectionable stream pollution showed that by careful operation and the application of about 3.25 lbs. of ferrous sulfate and 7.25 lbs. of lime per 1,000 gal. of waste the oxygen demand can be reduced approximately 75 per cent. If the sludge is allowed to accumulate in the tank the oxygen demand reduction averages only 34 per cent, because the precipitated organic matter goes partially into solution and is carried through the tank. Aeration of the tank effluent will effect a further reduction in the oxygen demand, approximately 50 per cent being indicated by laboratory tests. The chemical treatment will materially reduce stream pollution and prevent local nuisances created by pea cannery wastes.

Studies in the treatment of sulfite waste liquor from pulp and paper mills to reduce its oxygen demand in the control of stream pollution showed that ponding and aeration of the waste will effect a very material reduction in its oxygen demand. Mechanical aeration will also reduce the oxygen demand.

Data from stream pollution surveys are also included.

The fate of *B. coli* and *B. aerogenes* in sewage purification, H. HEUKELEKIAN (*Jour. Bact.*, 14 (1927), No. 1, pp. 55-67, fig. 1).—Studies conducted at the New Jersey Experiment Stations on the factors which operate in the reduction of *B. coli* and *B. aerogenes* in a sewage disposal plant are reported.

A study made over a period of seven months on the distribution of these two organisms in the different units of a sewage disposal plant showed no significant differences between the relative numbers at a given date for a given unit. The weekly fluctuations were great, but the monthly averages showed that the numbers in the incoming sewage were lower in the winter months. Ordinarily, no material reduction of the numbers of these organisms takes place in passing through an Imhoff tank, but invariably there is a reliable and material reduction in the filter beds, averaging as high as 89 per cent of the original numbers. There is no further reduction in the final settling tanks, but sometimes an increase.

There is no correlation between solid removal and bacterial reduction in the different units. Whereas maximum removal of solids takes place in the tanks, the maximum reduction of *B. coli* and *B. aerogenes* is in the beds, with

no corresponding decrease in solids. Their numbers are reduced in the beds due to unfavorable conditions for continued viability.

There is an increase in the numbers of these organisms in the effluent from the tanks as compared with the incoming sewage in winter months, due to more suspended solids passing out of the tanks. The lower temperature causes a low rate of digestion in the tank, which induces more of the liquid in the tanks to be displaced into the flow compartment and retards the reduction of these organisms in the tank.

When fresh solids are digested without seeding the numbers of *B. coli* and *B. aerogenes* rise to a maximum within two days, after which they fall rapidly to a low level. This coincides with the increase in acidity due to the attack of available carbohydrates. It is suggested that the *B. coli* group is mainly responsible for the decomposition of available carbohydrates in the beginning, giving rise to high acidity, which in turn checks their own numbers.

With daily additions of fresh solids to ripe sludge the same relationship holds, namely, an increase in *B. coli* and *B. aerogenes* to a peak within a week or so, the level of the peak depending on the amount of fresh solids added. Their numbers decrease after this until an equilibrium is reached, the level of which is also controlled by the amount of material added.

RURAL ECONOMICS AND SOCIOLOGY

Agricultural economics: Studies in scope and method, I-III ([*Reading, Eng.*: *Agr. Econ. Soc.*, 1927, *pts. 1*, pp. 7; 2, pp. 8; 3, pp. 12]).—The following studies are included:

1. *The teaching of agriculture*, C. S. Orwin.—The generally accepted scheme of agricultural education is briefly described, and recommendations are made that all work in general sciences during the first year be replaced by studies in general and agricultural economics, that familiarity with elementary general sciences be made a prerequisite to admission to agricultural colleges and agricultural schools, and that the business basis of farming be stressed in the teaching of farming technique.

2. *The use of statistics in the study of agricultural economics*, R. J. Thompson.—The types of agricultural statistics available and the purposes for which statistics may be used are discussed.

3. *Methods in marketing study*, A. W. Street.—A method of approach to commodity marketing investigation under British conditions is outlined.

Joint co-operative studies on the economics and sociology of rural life, E. L. KIRKPATRICK (*Amer. Jour. Sociol.*, 33 (1927), No. 2, pp. 222-230).—This is a paper presented at the twenty-first annual meeting of the American Sociological Society, held December 28-31, 1926. It is shown that the major problems dealing with farm life involve both the social and the economic aspects, and that studies in either field in order to yield maximum results must be augmented by considering the principal factors in the other field. A joint project is outlined for a study of the relation of the farmer's ability to pay to the standard of living of the farm family.

Research in rural sociology, C. C. TAYLOR (*Amer. Jour. Sociol.*, 33 (1927), No. 2, pp. 211-221).—The status, weaknesses, and needs of research in rural sociology are discussed. The development of research methods and trained research workers and the bringing about of an appreciation of rural social research are set forth as the chief tasks before the rural sociologists.

Scientific research in rural sociology, D. SANDERSON (*Amer. Jour. Sociol.*, 33 (1927), No. 2, pp. 177-193).—This is a paper presented at the Institute of

Research Methods in Rural Sociology held at Lafayette, Ind., in April, 1927 (E. S. R., 57, p. 4). The commonly accepted view of rural sociology is objected to in "that it fails to define the phenomena which are the peculiar subject matter of sociology, and consequently is impotent to discover any principles or generalizations which it may contribute to rural welfare as distinguishable from the application of principles of economics, political science, or psychology." The peculiar objects of attention of sociology are given as the forms of human association, the various sorts of human groups. Three distinct fields of investigation, the pure sciences of social psychology and sociology proper and the applied science of social organization, are described, and the investigations possible in each field in rural sociology are briefly outlined. An adequate methodology is believed to be the chief limiting factor at present in the progress of the scientific investigation of rural life.

Methods of social research, B. L. MELVIN (*Amer. Jour. Sociol.*, 33 (1927), No. 2, pp. 194-210).—This is a paper presented at the twenty-first annual meeting of the American Sociological Society, held December 28-31, 1926. The essentials in scientific methodology that can be adapted by rural sociology from the older sciences are analyzed. The following tendencies toward an evolution in scientific methods and techniques in rural sociological research are noted and described: Distinctive methods and techniques characterizing each project, new methods of research emerging as products, the creation of exact units of measurements, careful definition of the elements being studied, experiments in the field of community organization and social problems, and the use of the participant observer idea.

The paper is discussed by C. R. Hoffer and C. C. Zimmerman (pp. 206-210).

Report on the agricultural situation ([*Lexington, Ky.*]: *Assoc. Land-Grant Colls. and Univs.*, 1927, pp. 40).—This is the report of the special committee appointed by the executive committee of the Association of Land-Grant Colleges and Universities, previously referred to (E. S. R., 58, pp. 3, 4, 102).

Five year trends in Connecticut agriculture (*Connecticut Storrs Sta. Bul.* 146 (1927), pp. 111-238, figs. 33).—This bulletin contains reports of the following studies:

Trends in Connecticut agriculture, 1920-1925, I. G. Davis and J. R. Jacoby (pp. 111-156, 162-238).—This report was intended for use in conjunction with the bulletin previously noted (E. S. R., 53, p. 797). Pages 111-156 and 162 present by maps, graphs, tables, and text the most significant changes which have occurred from 1920 to 1925 in the number, size, and value of farms and the utilization of land; in the acreage of leading field crops, vegetables, and fruits; in dairying and livestock production; in the farm population; and in the character of roads. Pages 163-238 contain the figures by towns upon which the report is based.

Connecticut agricultural price changes, 1920-1925, A. E. Waugh (pp. 157-161).—Graphs with text are presented showing the trend, 1920-1926, of the prices of Connecticut farm products and of farm and nonfarm products in the United States.

Systems of beef cattle farming for southwestern Virginia, E. L. LANGSFORD and J. B. HURSON (*Virginia Sta. Bul.* 258 (1927), pp. 47, figs. 11).—This bulletin presents the results of a study made in cooperation with the Bureaus of Animal Industry and Agricultural Economics, U. S. D. A., to determine the advantages and disadvantages of feeding 3-year-old steers on grass alone, 2-year-old steers on grass alone, 2-year-old steers on grass with supplemental feed, and yearling steers on grass alone.

The price data used in the study consisted of market and price reports of the U. S. Department of Agriculture, records of prices received and paid by farmers on about 70 farms in the area in 1924 and on about 40 farms in 1926, the accounts of a few farmers, and the records of mills and feed, seed, and fertilizer stores for the period 1900-1926. The crop yield, livestock gain, and production requirement data were obtained from detailed records kept by 13 farmers during 1925-26; less detailed records kept by 25 farmers on about 1,500 cattle of different ages and weights, handled in different ways; reports of experiments, 1911-1926, of the U. S. Department of Agriculture and the West Virginia Experiment Station, previously noted (E. S. R., 44 p. 176; 51, p. 772; 56, p. 163; 58, p. 462), of a survey made in 1923-24 by the U. S. Department of Agriculture and the Virginia Experiment Station in southwestern Virginia, and of experiments during 1925-26 by the Virginia Experiment Station; and interviews with successful farmers and cattle growers in 1925 and 1926.

The systems of farming and the methods of handling cattle on three typical 400-acre farms and two 300-acre farms are analyzed and compared, and five suggested systems of farming for these farms are presented in detail.

An appendix includes the production and price data used in the study.

Forecasting cattle prices, J. A. HOPKINS, JR. (*Jour. Farm Econ.*, 9 (1927), No. 4, pp. 433-446, figs. 2).—A formula for forecasting cattle prices six months in advance is derived, using as factors the index of the 10 sensitive commodity prices as reported by the Harvard Economic Service, the price of corn, and the feeder cattle margin, each lagged 6 months, and the condition of the Corn Belt pasture and forage, lagged 7 months. The average difference between the results obtained with a formula and the actual prices for 1922-1926 was 3.8 per cent of the ordinates of secular trend. The standard deviation was 4.5 per cent, and the coefficient of correlation between the actual prices and the forecasts was +0.70. A formula is also derived for estimating current cattle prices, the above factors, together with net cattle receipts at 64 markets, prices of hogs, and index of condition of the western ranges being used, the several factors being lagged for different periods from 0 to 7 months. The average difference between the actual and estimated prices was 3.7 per cent, the standard deviation of these differences 4.7 per cent, and the correlation coefficient +0.61.

Price differentials in wheat between Minneapolis and Winnipeg, J. H. BREDIN (*Sci. Agr.*, 8 (1927), No. 3, pp. 175-183, fig. 1).—A multiple correlation analysis is made, using the price differential (the weighted monthly average price of the reported cash sales at Minneapolis, less the monthly average of the Winnipeg daily cash closing price, corrected for the rate of exchange) as the dependent variable and the following independent variables: (1) The production of hard red spring wheat in North Dakota, South Dakota, Montana, and Minnesota, (2) the percentage of No. 1 northern Manitoba of the total hard red spring wheat crop in western Canada, (3) the production of winter wheat in the United States, (4) the percentage of No. 1 northern spring of the total hard red spring wheat crop in the United States, and (5) the rate of duty. The coefficient of multiple correlation was 0.607.

The analysis showed that the production of hard red spring wheat and the percentage of high quality wheat in Canada are the most important factors; that the production of hard red winter wheat has considerable influence, especially if the American hard red spring wheat crop is unusually small; that changes in the rate of duty have little effect; and that the variation in the percentage of high grade hard red spring wheat in the United States is not sufficient to exert any marked effect.

Introductory readings in marketing: Commodity characteristics and marketing functions, E. L. RHOADES (*Chicago and London: A. W. Shaw Co., 1927, pp. IX+752, figs. 15*).—This volume contains a collection of material found useful in the School of Commerce and Administration of the University of Chicago in the teaching of beginning classes in marketing. Pages 51-307 are devoted to agricultural products. Chapters are included (pp. 3-48) on commodities and the functional approach, characteristics of market commodities, a classification of market commodities, and how to study a market commodity. These explain the method of comparative study, and present an approach which "is proposed as a theory which will harmonize the functional and commodity concepts of marketing and will introduce a scientific method of approach based on the analysis of methods in terms of their causes."

The marketing of farm products, edited by H. B. PRICE (*Minneapolis: Univ. Minn. Press, 1927, pp. XII+435, figs. 16*).—This volume includes, besides an introduction by the editor, the following studies describing the types of agencies in Minneapolis and St. Paul engaged in the distribution of the principal agricultural products and the relations of these agencies to each other: The Development of the Twin Cities as a Market for Farm Products, by M. Hartsough (pp. 9-44); Some Problems of the Minneapolis Grain Marketing Organization, by H. B. Price (pp. 45-107); Marketing Livestock at South St. Paul, by E. W. Gaumnitz (pp. 108-149); The Minneapolis and St. Paul Hay Market, by C. C. Zimmerman (pp. 150-177); Organization of the Fruit and Vegetable Market, by C. M. Arthur and A. L. Johnson (pp. 178-200); The Minneapolis Central Public Market, by A. L. Johnson (pp. 201-227); The St. Paul Public Market, by C. F. Clayton (pp. 228-247); The Auction as a Method of Sale for Fruit in Minneapolis, by C. B. Howe (pp. 248-258); The Twin Cities Potato Market, by E. C. Johnson (pp. 259-282); The Twin Cities Butter Market, by E. M. Daggit (pp. 283-319); Distribution of Milk in the Twin Cities, by W. C. Waite (pp. 320-345); Cold Storage in the Twin Cities, by W. C. Waite and E. M. Daggit (pp. 346-363); Rural Motor Truck Lines in the Twin Cities, by R. C. Engberg (pp. 364-389); The Function of Twin Cities Markets in Determining Prices, by H. Working (pp. 390-402); and The Geography of the Twin Cities Market Area for Farm Products, by J. D. Black (pp. 403-429).

Trenton's municipal markets, C. M. WOOLLEY, JR. (*Trenton, N. J.: Dept. Pub. Affairs, 1927, pp. 21, figs. 6*).—A description is given of the organization and operation of the municipal farmers' markets of Trenton, N. J.

Crops and Markets, [December, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), No. 12, pp. 449-512, figs. 3*).—Tables, graphs, notes, reports, and summaries under the usual headings are presented. Special tables and notes are included for the pig survey of December 1, 1927; the acreage, yield per acre, production, farm price, and total value by States, December 1, 1926 and 1927, for cereal grains, forage crops, fruits and vegetables, tobacco, and cotton; estimates of the commercial acreage, yield per acre, and production for shipment, canning, and manufacture, and price and value, 1924-1927, of truck crops; the monthly prices and weighted yearly average of prices for from 13 to 20 years for a number of important crops; and the estimated aggregate value by States, 1925-1927, of 22 of the leading crops, together with comparisons with the 1919 census values.

FOODS—HUMAN NUTRITION

American Red Cross text-book on food and nutrition, R. WHEELER (*Philadelphia: P. Blakiston's Son & Co., 1927, pp. XIII+123, figs. 12*).—This pamphlet has been prepared by the author, in collaboration with H. Wheeler, to replace the Red Cross course in food selection published in 1921 and 1922 for the use

of Red Cross classes and other groups desiring a reliable working knowledge of nutrition in its broader aspects. Tables and charts of food values and growth standards and a comprehensive bibliography are included. Accompanying the discussion of diets for loss of weight is a compilation from various sources of the approximate calorie content of some foods commonly eaten between meals, with ice cream sodas and sundaes and chicken salad sandwiches taking the lead at from 350 to 500 calories a serving.

Selected list of Government publications on foods and nutrition, compiled by R. VAN DEMAN (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 4* (1927), pp. 1-35).—A revision of the bibliography previously noted (*E. S. R.*, 51, p. 196; 55, p. 188).

Common food fallacies, T. S. HARDING (*Sci. Mo.*, 25 (1927), No. 5, pp. 451-460).—A refutation, with references to authoritative literature, of many of the food fads of the present time.

Flour for pretzels, J. H. SHOLLENBERGER and W. K. MARSHALL (*U. S. Dept. Agr., Tech. Bul. 46* (1927), pp. 16).—To determine the best kind of flour for pretzel manufacture, a survey was first made during the summer and fall of 1926 of approximately 50 pretzel bakeries located for the most part in Pennsylvania. The methods employed in these bakeries were ascertained, and samples of the flours used were obtained for analysis, with, in most cases, statements from the bakers concerning the baking qualities of the flours. From a comparison of the analyses of these flours for crude protein and ash with published data on the composition of hard red spring, hard red winter, and soft red winter wheat flours, it was apparent that soft red winter wheat flours and flour blends in which soft red winter wheat predominated were used chiefly.

Test bakes conducted in the laboratory with different flours also indicated that straight and patent grade flours such as those made from the soft winter wheats ranging from 8 to 10.5 per cent in protein content and not exceeding 0.5 per cent ash content are suitable for pretzel making. Blends of very low protein or weak flours with from 10 to 20 or even higher percentages of high protein flours from hard wheats were also satisfactory.

Tests were also made with various alterations in formulas.

A flour that had produced good results in laboratory tests was also tested out in two different commercial pretzel bakeries with good results. This flour was an unbleached 95 per cent "straight" milled from Pennsylvania soft red winter wheat. On a 15 per cent moisture content basis, the crude protein (nitrogen $\times 5.7$) content of this flour was 10.3 per cent and its ash content 0.36 per cent.

Refrigeration of fish, H. F. TAYLOR (*U. S. Dept. Com., Bur. Fisheries Doc. 1016* (1927), pp. 499-633, figs. 50).—This publication discusses the principles involved in the refrigeration of fish and the changes which may take place during the freezing process and subsequent cold storage, and describes in detail the design, construction, and equipment of fish freezers and various methods of freezing fish and storing the frozen product. Statistics on the amount of fish frozen in the United States monthly in 1925 by species and in 1920 to 1924 by totals, rates charged for the freezing and the cold storage of fish in New York City, and other miscellaneous information are included.

The absorption and utilization of inulin as evidenced by glycogen formation in the white rat, M. G. BODEY, H. B. LEWIS, and J. F. HUBER (*Jour. Biol. Chem.*, 75 (1927), No. 3, pp. 715-723).—The problem of inulin utilization by the animal body has been studied by determining the glycogen content of the livers of young rats after the oral administration of inulin and by analyzing the intestinal contents of the rats for the extent of absorption of the carbohydrate.

A definite increase in the glycogen content of the liver and the presence in the intestines of carbohydrates reducible only after hydrolysis are thought to indicate the utilization of the inulin to some extent. A short series of experiments in which, after a period of fasting, Jerusalem artichokes were fed to white rats also gave indication of slight but irregular storage of glycogen.

Notes on basal metabolism.—IX, Simplified calculation for gasometer gas analysis method. X, Simplified data blank for gasometer gas analysis method, W. H. STONEB (*Jour. Lab. and Clin. Med.*, 12 (1927), No. 9, pp. 884-888; 13 (1927), No. 2, pp. 164-171, figs. 2).—These two papers continue the series previously noted (E. S. R., 55, p. 592). In the first simplified formulas are developed for calculating the respiratory quotient and basal metabolic rate from gas analysis and gasometric data. The formulas for the basal metabolic rate are applicable to the Harris-Benedict, Dreyer, or Aub and Du Bois standards. The second paper describes and illustrates a blank for recording the data and calculations described in the foregoing paper.

The determination of the surface area of women and its use in expressing basal metabolic rate, H. S. BRADFIELD (*Amer. Jour. Physiol.*, 82 (1927), No. 3, pp. 570-576, figs. 2).—The author has calculated the surface area of 47 young women students at the University of Missouri by the following methods: (1) Direct measurement by the surface integrator of Elting (E. S. R., 55, p. 675), (2) by the Du Bois linear formula (E. S. R., 34, p. 68), (3) by the Wörner linear formula,* and (4) by the Du Bois height-weight formula as given by Roth.† The results obtained by the second, third, and fourth methods were compared with those obtained by the first method, and the percentage deviations were calculated. Similarly, the data obtained by the first three methods were checked against those obtained by the Du Bois height-weight formula. Sixteen of the subjects were selected for basal metabolism studies to compare actual data with values predicted from the various measurements.

The surface area measurements obtained with the integrator averaged the same as those obtained by the Wörner linear formula, and were about 6 per cent below the area obtained by the Du Bois linear formula and nearly 2 per cent below the area obtained by the Du Bois height-weight formula. The range of deviations was about the same by all formulas and was somewhat greater than has been reported for men.

The averages obtained in the basal metabolism determinations showed about 2 per cent greater deviation from the Aub-Du Bois standards than from the Harris-Benedict or the Dreyer standards when the Du Bois height-weight formula was used to calculate the area, but approximately the same deviation from all standards when the area was calculated by the integrator. The average basal metabolism was about 6 per cent below that predicted by all standards used and was the same as that predicted by Krogh as noted by Du Bois (E. S. R., 57, p. 291). The general conclusions drawn are as follows:

"The results of this investigation indicated that the Krogh modification of the Aub-Du Bois standards should be used for prediction of basal metabolism of women; that if the Du Bois height-weight formula is used to calculate surface area of women, a correction of ± 2 per cent should be made; and that the maximum error in applying a formula to women even after such a correction is made is ± 7 per cent instead of ± 5 per cent, the error predicted for men. About 70 per cent of the cases studied would fall within ± 3 per cent and about 95 per cent within ± 5 per cent."

* Ztschr. Gesam. Expt. Med., 33 (1923), pp. 510-526, figs. 2.

† Boston Med. and Surg. Jour., 186 (1922), pp. 457-465, figs. 8.

The actual consumption of food in Japan, S. TODA (*Japan Med. World*, 7 (1927), No. 2, pp. 41-45, pl. 1).—In this analysis of the extent and quality of food consumption in Japan during 1917 to 1924, the author first calculated the amounts of classified food materials consumed from the statistical figures of imports and exports. These figures were then used as a basis for various additions according to the judgment of different authorities. From both sets of figures, after suitable deductions were made for waste, the consumption of each type of food per man per day was calculated from population figures on the assumption that the mixed population of 56,000,000 would require about the same amount of food as 43,000,000 adults. The figures thus obtained were compared with the analyses by C. Koidzumi of diets for various occupations of light, moderate, and heavy work and with the Voit standards.

The Japanese values obtained by the three methods did not vary greatly among themselves and differed from the Voit standards chiefly in a much lower percentage of fat, 5 as compared with 17 per cent. The carbohydrate, as was to be expected with a large consumption of rice, was considerably higher and the protein lower than the Voit standard. The ratio of animal to vegetable protein was 1:4 in the Japanese figures as compared with 1:3 in those of Voit.

The author concludes that the average production of food materials in Japan proper is almost sufficient to meet the physiological demands of food quantity for the present population, but that one of the most important food problems is the improvement of the quality of the food by an increase in the supply of protein of animal origin. An increase in the utilization of fish is suggested as the most practical means of improving this condition.

The fundamental food requirements for the growth of the rat.—II, The effect of variations in the proportion and quality of recognized nutrients, L. S. PALMER and C. KENNEDY (*Jour. Biol. Chem.*, 75 (1927), No. 3, pp. 619-659, figs. 20).—This paper reports in detail the attempts which have been made to produce normal growth in rats by varying the proportions and purity of the different ingredients in the basal diet described in the previous paper of the series (*E. S. R.*, 58, p. 192). The results obtained are thought to rule out deficiencies in vitamins C, D, and E, mineral salts, and amino acids as responsible for the eventual decline on the basal diet. Uncertainty is expressed concerning vitamin B, the chief source of which was wheat embryo extract. Different preparations of this gave different growth results. Supplementing the wheat embryo extract with Osborne and Mendel's yeast fraction II gave no better growth, but supplementing it with fresh yeast did. Better growth was secured when the diet contained unpurified than purified lactose and purified than unpurified beef muscle meat.

The relation of the rate of growth to diet, II, L. B. MENDEL and H. C. CANNON (*Jour. Biol. Chem.*, 75 (1927), No. 3, pp. 779-787).—Additional records are presented of the rates of gain in weight of both male and female rats on an improved stock diet (*E. S. R.*, 56, p. 191). The 20 best records of average daily gains are given for male rats from 60 to 300 gm. and for females from 60 to 200 gm. in weight. The minimum and maximum gains per day for the former were 4.8 and 6.1 gm. and for the latter 2.6 and 4 gm., respectively. The corresponding times required for completing the gains in weight taken as standard were 50 and 39 days, respectively, for the males, and 54 and 35 days for the females.

A comparison of these figures with gains in weight after periods of suppression of growth reported several years ago (*E. S. R.*, 34, p. 862) showed that the rapid gains of recovery periods in the earlier study rarely surpassed the present

gains made under the best conditions of uninterrupted growth. "In view of such results one may raise the question whether it is necessary to postulate any extraordinary capacity for gain incident to resumption of growth after it has been suppressed. Perhaps the increment of weight under such conditions is merely illustrative of what can take place at any early period of growth, provided the proper food factors are supplied."

Similar comparisons with the growth through the same period of rats treated parenterally with fresh anterior hypophyseal fluid as reported by Evans indicate no marked increase in the rate of growth of the treated rats beyond that attained through diet alone.

Preliminary observations on the age of sexual maturity of the rats which had grown so rapidly have shown no tendency to sexual maturity at exceptionally early ages.

Second Conference on Research in Child Development, Washington, D. C., May 5-7, 1927 (*Washington, D. C.: Com. Child Develop., Natl. Research Council, 1927, pp. V+123, pl. 1*).—Of particular interest among the papers presented at this conference and here reported in mimeographed form are those given at the sessions on anatomy and physical growth and on nutrition as follows: Anthropometric Measurements of Children and Adults, by B. T. Baldwin (pp. 2-7); Recent Work on the Physical Development of Children, by R. E. Scammon (pp. 8-15); Body Build in Children, by C. R. Bardeen (pp. 16-20); The Approach to the Study of Nutrition through Field Investigations, by E. V. McCollum (pp. 29-32); The Approach to the Study of Nutrition through Laboratory Investigation, by A. L. Daniels (pp. 32-40); and The Approach to the Study of Nutrition through the Nursery School, by L. J. Roberts (pp. 40-46).

Supplementary feeding of school children, A. F. MORGAN and M. A. TANNER (*Amer. Jour. Diseases Children, 33 (1927), No. 3, pp. 404-407*).—Further data on the effect of the supplementary feeding of oranges or pulled figs on the nutritional status of school children (*E. S. R., 56, p. 693*) have been obtained in a comparison of the gains of high school students of 14 to 18 years of age after supplementary lunches for 8 weeks. Eight of the subjects had 4 pulled figs and 17 an orange apiece daily, while 11 received no supplementary lunch. Of the entire group of 36, 29 showed definite undernutrition by the Baldwin-Wood scale and 19 by the Dreyer scale at the beginning of the experimental period. The average gains in weight were 1.64, 1.62, and 0.77 lbs. for the groups receiving oranges, figs, and no supplementary food, respectively. The percentages of the groups making weight gains were 64.7, 75, and 54.5, respectively. "It is evident that the supplementary feeding of these fruits proved advantageous to the children, whether merely through added caloric intake or through vitamin or basic ash content."

The respiratory metabolism in infancy and in childhood.—VI, The specific dynamic action of food in normal infants, S. Z. LEVINE, J. R. WILSON, F. BERLINER, and H. RIVKIN (*Amer. Jour. Diseases Children, 33 (1927), No. 5, pp. 722-731*).—Using the apparatus and methods described in the first two papers of the series (*E. S. R., 55, p. 792*), the authors have determined the effect of various foods on the metabolism of two normal infants, aged 3 and 4 months.

The basal metabolism of these subjects, as obtained during sound sleep and from 2 to 3 hours following small meals of cow's milk furnishing 62 and 34 calories, respectively, equaled 42.5 and 41.4 calories per square meter per hour. The test meals consisted of cream, glucose, casein, and cow's milk, respectively, each furnishing approximately 125 calories. The fat, milk, and protein meals raised the metabolism of one of the subjects 8, 4, and 15 per cent above the basal level and of the other subject 1, 9, and 17 per cent above the basal level in the

3 hours after ingestion. The metabolism of the second subject was also raised 8 per cent above the basal level by the glucose meal.

The bacteriology of dried powdered milk preparations used in infant feeding. G. F. and G. H. DICK (*Amer. Jour. Diseases Children*, 34 (1927), No. 6, pp. 1040, 1041).—In connection with the study of an epidemic of enteritis occurring in an institution in which the infants received artificial feedings composed largely of dried protein milk, a bacteriological examination was made of preparations of dried milk in use in two institutions, the samples in all cases being taken under sterile conditions from previously unopened cans.

Two samples of a powdered protein milk contained totals of 88,000 and 80,000 bacteria per gram of powder, a sample of powdered casein 14,000, and one of powdered modified milk 19,000 per gram. A sample of powdered whole milk contained a rapidly spreading bacillus that made accurate counts impossible. Green-producing streptococci constituted a considerable percentage of the organisms isolated. A feeding prepared at one institution from the first sample of protein milk contained 22,000 bacteria per cubic centimeter, of which 11,000 were green-producing streptococci. A similar feeding prepared at the other institution from the second sample of protein milk contained 9,000 bacteria in 1 cc., with 7,000 green-producing streptococci.

"The presence of a variety of living bacteria, including streptococci, in preparations of powdered milk indicates that the methods of manufacture do not destroy the bacteria in the milk and that the bacteria remain viable in the powder. The preparation of powdered milk feedings without boiling or pasteurization in order to avoid curdling allows the bacteria in the powder to persist in living form in the feeding."

The relation of maternal diet to hemorrhage in the new-born. C. U. MOORE and J. L. BRODIE (*Amer. Jour. Diseases Children*, 34 (1927), No. 1, pp. 53-60, figs. 2).—The authors report a case of hemorrhage in a 5-day-old baby, the symptoms and autopsy record of which resemble closely experimental findings on rats (E. S. R., 58, p. 391). The diet of the mother had been extremely deficient in both vitamins B and C; but since the child showed no symptoms of scurvy and antiscorbutic preparations were without effect, the hemorrhage was attributed to the lack of vitamin B in the mother's diet. It is suggested that diets restricted by poverty, pernicious vomiting, diabetes, or other causes need careful scrutiny from the standpoint of vitamins.

Studies on the anemia of rice disease.—The effects produced by the addition of betaine hydrochloride, lactose, vitamins A and C, magnesium sulphate or mineral oil to the polished rice diet of pigeons, O. W. BARLOW (*Amer. Jour. Physiol.*, 83 (1927), No. 1, pp. 237-244, figs. 4).—This paper confirms the theory advanced by various investigators, particularly Drummond and Marrian (E. S. R., 56, p. 694), that the symptoms of vitamin B deficiency are strikingly similar to those of starvation.

In the present study, pigeons on polished rice were given various supplements designed to counteract the gastrointestinal stasis thought to be a contributing factor to symptoms of vitamin B deficiency. The administration of loosely-bound hydrochloric acid (betaine hydrochloric acid) to increase the acidity of the digestive juices, and butter and orange juice to make up for lack of vitamins A and C, had no effect on body weight, respiration, temperature, and red corpuscle counts of pigeons subsisting on polished rice. The administration of lactose, mineral oil, or magnesium sulfate appeared to prevent the anemia without affecting the other depressive effects.

It is noted that the extent of changes in weight, respiration, temperature, and red blood counts corresponds very closely to half of the corresponding changes in fasting, and that the condition might be described as an incomplete fast.

The antisterility vitamin E fat soluble E, H. M. EVANS and G. O. BURR (*Calif. Univ. Mem.*, 8 (1927), pp. [5]+176, pls. 12, figs. 5).—This monograph constitutes the complete report, with experimental data, of the extensive studies on vitamin E which have been conducted at the University of California, first by Evans and Bishop (*E. S. R.*, 51, p. 167) and later by Evans and Burr (*E. S. R.*, 54, p. 561). Chapter 2 on the histopathology of gestation in animals deprived of vitamin E has been contributed by T. L. Althausen. A bibliography and several microphotographs illustrating the changes in the reproductive organs brought about by lack of vitamin E are included.

Endemic goiter among school children, R. OLESEN (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 52, pp. 3180-3189, figs. 5).—This comparison of the data obtained under comparable conditions by members of the U. S. Public Health Service in thyroid surveys in six States and one city indicates the relative incidence of goiter to be in the following order of decreasing rate: Minnesota, Cincinnati (*E. S. R.*, 52, p. 165), Oregon (noted below), Colorado (*E. S. R.*, 53, p. 663), Montana (*E. S. R.*, 52, p. 166), Connecticut, and Massachusetts (*E. S. R.*, 57, p. 296).

Endemic goiter in Oregon, R. OLESEN (*Pub. Health Rpts. [U. S.]*, 42 (1927), No. 46, pp. 2831-2849, figs. 2).—A thyroid survey of 8,181 boys and 9,427 girls attending the senior and junior high schools and the upper grades of the grammar schools in 32 localities in Oregon showed thyroid enlargement in varying degrees in 22.3 per cent of the boys and 38.3 per cent of the girls. As has been noted in previous surveys, the thyroid enlargements in the boys decreased in number with increasing age, while the reverse was true in the girls up to the age of 18 years. Endemic goiter was present to a considerable extent in the seacoast towns, but not to so great an extent as in the inland cities and towns. There appeared to be no relationship between the amount of goiter in any given community and the bacteriological purity of the water.

In view of the alleged harmful effects exerted upon hypersusceptible individuals by attempts at universal prophylaxis, the author recommends that the children in any given community be separated into thyroid-normal and thyroid-enlarged groups, the former to be given individual oral prophylaxis, preferably in connection with the medical inspection system in the schools, and the latter to be referred to physicians skilled in the treatment of such conditions. Concerning iodized table salt, the statement is made that "iodized table salt, a prophylactic of distinct promise, is under a cloud of suspicion at the present time because of alleged harmful effects exerted upon hypersusceptible individuals. While some of these reports are undoubtedly authentic, it is believed that the incidence of endemic goiter has been reduced in an encouraging degree in some localities by the general use of iodized table salt. It can only be hoped that the iodine content of salt can be so adjusted as to be efficient in preventing simple goiter and, at the same time, be incapable of exciting a diseased gland to hyperfunction. Until such a scientific readjustment of the iodine content has been made it may be best not to advocate the widespread use of artificially iodized table salt. Persons with goiters should certainly be cautioned against the use of iodized salt, for it is inconceivable that existing thyroid enlargements will be benefited by the ingestion of this commodity. On the other hand, it is likely that some forms of goiter may be made worse by the unrestricted use of iodized salt."

The relation of endemic goitre to the iodine-content of soil and drinking-water, I, III, R. McCARRISON (*Indian Jour. Med. Research*, 15 (1927), No. 1, pp. 207-211, 234-246).—This is a discussion of different types of goiter and of the relation of the iodine content of the soils and water in certain localities in India to the incidence of the classical adeno-parenchymatous type of endemic

golter. In the author's opinion this type of golter, as manifest in India, is due not to a deficiency of iodine but to the unhygienic condition of life of the people, particularly the bacteriological impurity of their drinking water and surroundings. Part 2, on methods of determining iodine is noted on page 507.

Obesity: Recent reports in the literature and results of treatment, L. BAUMAN (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 1, pp. 22-24).—This paper reviews briefly the literature on the specific dynamic action of protein in obesity and the change in basal metabolism during overfeeding, and describes the organization and operation of an ambulatory clinic for adipose patients at the Presbyterian Hospital, New York City. Statistics obtained in this clinic and a description of the recommended low calorie diet, furnishing approximately 100 gm. of carbohydrate, 70 of protein, and 60 of fat, are included.

Treatment of pernicious anemia with the liver diet and with irradiated ergosterol (Vigantol) [trans. title], G. ROSENOW (*Klin. Wchnschr.*, 6 (1927), No. 33, pp. 1560-1562).—Although the number of cases reported on is too small to furnish conclusive evidence, better results were obtained in the treatment of pernicious anemia by the Minot-Murphy liver diet when this was supplemented by therapeutic doses of irradiated ergosterol (Vigantol).

TEXTILES AND CLOTHING

The relation between the tensile strength of an abaca fiber and the length of the individual cells composing it, C. G. DERECHO (*Philippine Agr.*, 16 (1927), No. 7, pp. 441-445).—Determinations at Los Baños, P. I., showed that individual cells 3.85-4.64 mm. long, from the middle portion of the abaca fiber strand, are considerably longer than those from the lower (3.18-4.53 mm.) or upper (3.68-4.11 mm.) portions. The tensile strengths of the middle portion of fibers from the sixth, seventh, and ninth leaf sheaths were from 25 to 32 per cent higher than the lower and from 23.5 to 36 per cent higher than the upper portion. There appeared to be a direct relation between the tensile strength and the length of cells composing a fiber. Evidently the middle portion of abaca fiber may be used for cordage requiring great strength.

Technological reports on standard Indian cottons, 1927, A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul.* 11 (1927), pp. VI+117, figs. 21).—This report includes results of the tests on the standard cottons of the 1926-27 season in addition to those of the seasons noted earlier (*E. S. R.*, 57, p. 694). The agronomic and technological data are amplified, two new cottons have been included in the series, and certain modifications in the technique are indicated.

Details of fibre in connection with cocoons (*Silk Jour.*, 3 (1926), No. 30, p. 41; *abs. in Jour. Textile Inst.*, 18 (1927), No. 10, p. A313).—The table given shows the diameter of fibers, the elasticity of thread, the tensile strength, and the size of cocoons of a dozen different breeds of silkworms. The thickness of the fiber of the Indian *Atticus mylitta* is three times that of Chinese *Bombyx mori*, that of *A. cythia* has the highest elasticity, and *Antheraea yamamai* of Japan has the greatest tensile strength.

Reports of research work on the fastness to light of dyestuffs on woollen and worsted fabrics (*Jour. Soc. Dyers and Colourists*, 43 (1927), Nos. 8, pp. 253-266, figs. 11; 9, pp. 296-302, figs. 7).—This report of research organized by the Colour Laboratories of the British Research Association for the Woollen and Worsted Industries on the determination of the fastness to light of dyestuffs is presented in the following sections:

I. *A comparison of the fading of dyestuffs in tropical and in English sunlight and by artificial light*, S. G. Barker and H. R. Hirst (pp. 254-261).—Woollen and worsted fabrics dyed with 56 dyes were exposed to sunlight in India,

Ceylon, and England, and to light from a fadeometer. Measurements with the Lovibond tintometer showed that fading could be indicated as simple loss of color, an actual color change to a different tint, or a loss in brightness without color loss. Groups formed by visual estimation of fading were in fair agreement with the tintometer estimations. With ultra-violet radiation it was found that undyed wool gave a distinct fluorescent effect which decreased after exposure to sunlight and even disappeared entirely after prolonged exposure to sunlight or in the fadeometer. Dyed patterns, on the contrary, exhibited a reverse effect, the fluorescence becoming brighter with prolonged exposure. Comparison of the fluorescent properties of the faded samples made it possible to distinguish which patterns had been exposed in England, in India, or in the fadeometer. The fact that the fadeometer data were not in accord with those from sunlight exposure and that less fading occurred in the Tropics than in India seemed largely due to differences in humidity conditions of the atmosphere.

II. *Atmospheric humidity and the fading of dyestuffs*, J. J. Hedges (pp. 261, 262).—Exposure of fabrics dyed red, green, and blue to ultra-violet light from a mercury arc in quartz at relative humidities ranging from 24 to 100 per cent showed that color losses increase with increase in humidity, suggesting the need of prescribed standard humidity for all fading tests.

III. *Relation between time of exposure and loss of colour due to fading*, S. G. Barker, H. R. Hirst, and P. N. Lambert (pp. 263, 264).—Patterns of the same dyed worsted cloth were exposed in a fadeometer for different periods. It was observed that under standard conditions the loss of color has a direct relation to time of exposure, although this is not linear, since the color loss is more rapid in the earlier stages. An approximate law is proposed. The tests suggested that in standardization of color fastness the exposure should be long enough to permit the fading to exceed the initial more rapid fading action.

IV. *Relation between initial depth of shade and loss of colour due to fading*, S. G. Barker, H. R. Hirst, and P. N. Lambert (pp. 264–266).—According to the proportionate losses of the predominant color in worsted samples, dyed to different depths of shade with each of 16 dyes, caused by sunlight and by the fadeometer, the total color loss was the same in all cases. This explains the assumption that darker shades are relatively faster than light ones of the same dyestuff. Since each shade loses the same amount of color, the darker shade is losing a less proportion of its original color and it appears not to fade so much as the light shade.

V. *The effect of ultra-violet radiation on the fading of dyed fabrics*, L. Hill (pp. 296, 297).—Samples of worsted dyed with three different dyes were variously exposed through five types of glass screens to a mercury vapor lamp. Part of the samples remained at normal humidity, and others were kept wet during the experiment. The data showed that increased fading occurred with increase of the quantity of ultra-violet radiation, both from the viewpoint of percentage transmitted and distance further down the spectrum into the ultra-violet region. Moisture seemed to promote fading. It seemed that for results to be comparable with sunlight fading any artificial fading lamp must transmit to the fabric only such radiation in the ultra-violet as exists in the solar spectrum.

VI. *The transmission of sunlight through glass and its effect on fading of dyestuffs*, I. O. Griffith and R. G. C. Jenkins (pp. 297–299).—Experiments concerned with the transmissibility of different kinds of plate glass and other special types of glass used in studies on color problems demonstrated that the effect of transmission of light through plate-glass windows is to cut out a large

amount of the ultra-violet from sunlight, to eliminate entirely the far ultra-violet, which is a most potent factor in fading of dyed fabrics, and to decrease the intensity of the visible portion of the spectrum by at least 10 per cent of its original value. Fading is slower in a well-ventilated space behind glass. The apparent increase in fading power behind glass sometimes observed appears to be due to other causes, such as humidity and atmospheric conditions.

The light transmitted through glass is inferior to sunlight in fading ability. Since vitaglass stops very little of the solar spectrum, it is held justifiable to use vitaglass screens for the protection of fabrics in fading tests. While quartz is translucent to all the radiation of the solar spectrum, it is too costly and is difficult to obtain in large, even sheets.

VII. *Radiation from gas filled electric lamps* (pp. 299, 300).—Curves showing the energy distribution of gas filled electric bulbs indicated that a marked deficiency of light energy exists in the ultra-violet part of the spectrum. Since ultra-violet radiation practically does not exist in these lights, it seemed extremely unlikely that they would cause fading, and in any event fading would be considerably less than that due to exposure to direct sunlight.

VIII. *An exposure cabinet for outdoor fading tests*, S. G. Barker and H. R. Hirst (pp. 300, 301).—The device described resembles a meteorological instrument shelter and protects samples from dirt, transmits the entire solar spectrum, and permits free access of atmosphere.

IX. *Humidity and temperature tables*, compiled by S. G. Barker and H. R. Hirst (pp. 301, 302).—Tables show the average monthly and yearly relative humidity percentages and temperatures for the principal points of the most important parts of the world.

Light sources for testing the fastness of dyes, I. H. HADFIELD (*Jour. Textile Inst.*, 18 (1927), No. 10, pp. T527-T558, figs. 12).—This is a summary of information published before December, 1925, which is concerned with the suitability of different artificial sources as standard lamps for dye fading tests. Sixty-three references are listed.

HOME MANAGEMENT AND EQUIPMENT

Architecture and home organisation ([London]: Assoc. Teachers Domestic Subjects, 1926, pp. [1]+40, figs. 5).—Practical information on the subject is given.

Planning and recording family expenditures, C. G. WOODHOUSE (*U. S. Dept. Agr., Farmers' Bul.* 1553 (1927), pp. 11+22, figs. 15).—A classification of the items of family income and expenditure is included. Different methods of and forms for recording such income and expenditures are described and illustrated.

The future development of washing machines [trans. title], O. NEUMANN (*Gandhts. Ingen.*, 50 (1927), No. 34, pp. 613-619, figs. 5).—The history and future development of domestic washing machines to meet German conditions is discussed.

House-heating (*New York: Amer. Gas. Assoc.*, 1926, 2. ed., pp. 121, figs. 145).—This is the second edition of this book, which is a reference on the application of gas to house-heating. It contains chapters on analysis of the house-heating load, combustion and fuels, the calculation of heat transmission, gas-fired warm air systems, gas-fired steam heating and hot water systems, additional features of heating systems, standard code for testing and rating gas-fired steam boilers, individual room heaters, and service. An appendix of practical data is also included.

Free-burning carbonised fuels for the open fire, H. H. GREGER (*Fuel*, 7 (1928), No. 2, pp. 90, 91).—This is an abstract by W. T. R. Braunholtz of a report from Germany of experiments conducted in Japan with 14 different free burning fuels. In general, it was found that increasing ignition temperature corresponds to an increase in the volume of air per minute required for fuel consumption of 40 per cent for all fuels tested except gas coal semicoke.

Residential water heating, R. R. HERRMANN and K. R. McCLUNG (*Elect. World*, 91 (1928), No. 7, pp. 341-346, figs. 8).—The results of investigations on residential water heating are presented, the purpose being to reduce the cost of such service. No conclusions are drawn.

Household refrigeration, H. B. HULL (*Chicago: Nickerson & Collins Co.*, 1927, 3. ed., rev. and enl., pp. 491, figs. 218).—This is the third revised and enlarged edition of this book (E. S. R., 57, p. 97).

MISCELLANEOUS

Work of the Scotts Bluff Field Station, 1922 to 1925, J. A. HOLDEN (*U. S. Dept. Agr. Circ.* 5 (1927), pp. 46, figs. 6).—This report includes a summary of meteorological observations from 1911 to 1925, a review of agricultural conditions on the North Platte Reclamation Project, located in Scotts Bluff County, Nebr., and a report of the work on the experimental farm from 1922 to 1925, inclusive. The experimental work reported is for the most part abstracted elsewhere in this issue.

Biennial Report of the Massachusetts Agricultural Experiment Station, [1925-26], S. B. HASKELL (*Massachusetts Sta. Bien. Rpt.* 1925-26, pp. 16).—This contains the organization list and a report of the director for the fiscal years ended November 30, 1925, and November 30, 1926.

Report of the Porto Rico Agricultural Experiment Station, 1926, D. W. MAY ET AL. (*Porto Rico Sta. Rpt.* 1926, pp. [2]+31, figs. 11).—This contains the organization list, a report of the director as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, horticulturist, plant breeder, agriculturist, plant pathologist, and parasitologist. The experimental work is for the most part abstracted elsewhere in this issue.

NOTES

Kansas College and Station.—An industrial research project, financed by two incubator companies, for the study of disinfectants to control the possible dissemination of bacillary white diarrhea in incubators was begun February 1. The primary object of the work will be to determine whether disinfectants can be used effectively in destroying *Salmonella pullorum* in incubators without injury to incubating eggs and hatching chicks. The proper dosage will be determined if disinfectants prove practical, and in the event that they do not mechanical means of controlling the spread of the disease will be studied.

The new \$250,000 library was officially opened on January 10. Construction has been begun on a new heating and power plant building, which will cost when completed approximately \$315,000.

Massachusetts College and Station.—Miss Elsie Nickerson has been appointed technical assistant in home economics, beginning January 1. Hubert W. Yount, assistant research professor of agricultural economics, was transferred October 1, 1927, from station to college work.

Mississippi College and Station.—E. A. Currey, formerly connected with the agronomy teaching staff, has been appointed an assistant at the Delta Substation, and W. W. Welborn, a recent graduate of the college, an assistant at the South Mississippi Substation.

North Dakota College and Station.—Dr. Charles J. Parshall of the department of comparative pathology and bacteriology of Cornell University has been appointed instructor in the veterinary department of the college and station, effective July 1.

Pennsylvania College.—The substantial completion of the girls' dormitory fund, sponsored by the State Grange of Pennsylvania, is announced. It is hoped that work will be begun on the new structure during the coming spring.

Paul Thayer, professor of pomology extension, has resigned to become manager of a fruit farm near Carlisle.

Rhode Island College and Station.—Dr. B. E. Gilbert, chemist in the station, has been appointed acting director. Dr. B. L. Hartwell, connected with the institution since 1891 and director since 1912, is continuing as professor of agricultural chemistry and station agronomist.

South Dakota College and Station.—The chemistry building was totally destroyed by fire February 4. All records, including many belonging to the station, together with equipment, samples, and all material, were completely destroyed.

C. F. Wells, assistant professor of chemistry and assistant chemist, has resigned to accept a commercial position.

Tennessee University.—An agricultural short course for ministers was held at the university from February 6 to 17. This course dealt with rural economics, the relation of the church to the rural community, and information relative to horticulture, farm crops, soils, and livestock. Round table discussions were held three nights each week for the consideration of rural problems. About 20 ministers from east, middle, and west Tennessee and representing various denominations were present. It is expected that this short course will be an annual event at the institution.

EXPERIMENT STATION ~~RECORD~~

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The traditional aloofness of private benefactions from agricultural education and research seems to be disappearing. Within the past five years at least three gifts involving over a million dollars each have been announced, besides numerous smaller contributions, and it appears that the possibilities for public service through financial aid to the agricultural colleges and experiment stations by individuals and groups are gradually coming to be realized as never before.

In 1924 two large bequests were made public upon the death of the donors, and on one of these litigation is still going on. This is the Lotta Crabtree bequest to the Massachusetts Agricultural College, whereby the college is made residuary legatee of Miss Crabtree's estate for the purpose of establishing the Lotta Educational Fund. This fund is intended partly to assist needy students to complete their course in college, but is mainly to be used for loans without interest to graduates desiring to engage in farming but lacking the necessary capital. Even though the funds ultimately available under this bequest may fall below the tentative estimate of at least \$1,000,000 which seemed probable some time ago, the expressed purpose of the bequest as an "attempt to aid in some of the great social and economic questions of the times" by "the intelligent and active promotion of agricultural pursuits" is both significant and praiseworthy.

The second bequest in 1924 was for the establishment of the Herman Frasch Foundation for Chemical Research. This bequest was carried in the will of the late Mrs. Elizabeth Blee Frasch, widow of Herman Frasch, who was chemist and head of a large sulfur company. Its validity was upheld in 1927 by a decision of the New York Court of Appeals wherein research, "the method used by modern universities and scientific foundations to increase the sum of human knowledge," is, when conducted for such purposes and by such institutions, deemed clearly educational and benevolent within the meaning of the statute restricting the creation of a perpetual trust. The amount of the fund thus made available is \$1,000,000, and under the terms of the will the income is to be paid to one or more incorporated institutions in the United States, selected by the administering trust company after consultation with the American Chemical Society, "upon condition that the said institution shall

agree that the money so received shall be devoted to research in the field of agricultural chemistry with the object of attaining results which shall be of practical benefit to the agricultural development of the United States." These grants are to be made for five-year periods, but are renewable if progress within that period is satisfactory to the society. Steps are now under way, it is understood, to select the institution or institutions for the initial five-year period.

The third large gift to agriculture was formally tendered to the University of California on February 10, 1928. This is a contribution to the university of \$1,500,000 by the Bancitaly Corporation of San Francisco in tribute to its founder and president, Mr. A. P. Giannini, and is to be used primarily for the establishment of the Giannini Foundation of Agricultural Economics.

This gift is proffered by a corporation which constitutes, with its subsidiaries, one of the largest chain of banks in this country. The funds provided are said to represent President Giannini's personal share of the earnings of this corporation, and are thus utilized in response to his expressed desire to do something through the university for the farmers of California. This interest of his in agriculture is doubtless due in part to his memories of boyhood days on a farm in the Santa Clara Valley as the son of an Italian vegetable grower and his experience of 20 years in the wholesale fruit and produce business in San Francisco, but may also be attributed in some degree to the many contacts of his banking interests with agricultural conditions. As a recent statement of Mr. James A. Baciagalupi, vice president of the Bancitaly Corporation, sets forth, "agriculture is, of course, of primary interest to us, and the unfortunate circumstances in which many of our farmers and fruit growers find themselves, through no fault of their own, has suggested the desirability of attempting a scientific study of the problem with the hope of finding a suitable solution."

As its name implies, the Giannini Foundation of Agricultural Economics will be devoted to activities in this field. Specific mention is made in the offer for its establishment of such phases as the following: The economic consequences of increased production which result from improvements in seed grains, nursery stock, livestock, machinery, and methods of farming; the economic consequences of overproduction arising from unusually favorable seasons as to weather and other conditions in the producing nations; the relations between conditions existing in the farming industry and the general economic conditions prevailing in the nation and internationally; the acquiring of such knowledge concerning soil qualities and climatic and other conditions in any or all parts of the State of California, and of such knowledge concerning existing or prospective supply and demand conditions for the various agricultural products of this State, as will

enable the appropriate representatives of the foundation to advise the farmers of California as to wise plantings, sowings, breedings, etc., in relation to areas and kinds; the methods and problems of disposing of farm products on terms or conditions giving maximum degree of satisfaction to the producers; and any economic questions which concern the individual farmer and the members of his family. This enumeration obviously includes some matters usually thought of as falling within the field of production or the purview of rural sociology, but the most significant aspects are doubtless the possibilities open for development of the agricultural economics work along very broad lines.

The terms of the offer, however, make it very clear that the primary function of the foundation is to be that of a research agency, "with purpose to find the facts and conditions which will promise or threaten to affect the economic status of California agriculturalists" and, as allied to this, "of forming ways and means of enabling the agriculturalists of California to profit from the existence of favorable facts and conditions and to protect themselves as well as possible from adverse facts and conditions." "Teaching activities," it is stated, "will undoubtedly be called for, certainly to prepare promising students to assist in carrying on the work of this foundation, and also for service in wider spheres, but it is understood that said teaching service will be conducted largely and if practicable wholly upon the basis of funds made available to the College of Agriculture from other sources."

The question of securing adequate housing facilities for the foundation is answered by a provision that not to exceed \$500,000, or substantially one-third of the total gift, is to be used by the regents of the university for the construction and equipment of Giannini Hall. This building is to be erected as the third structure in the set of three buildings which will constitute the main College of Agriculture group at Berkeley, and will conform architecturally in essential details to the oldest unit, Hilgard Hall. Funds for this building are to be made immediately available so that construction can go on with all possible celerity. Since in the beginning it is not expected that the activities of the foundation will require the use of the entire building, its utilization for other needs of the College of Agriculture or the United States Department of Agriculture is authorized until such time as the expansion of the foundation's work requires the full facilities.

The offer has been accepted by the board of regents of the university, and a portion of the funds has already been transferred. The agreement provides for the payment of the remainder in installments ending two years and three months from the beginning of the

erection of Giannini Hall, but the entire amount is to be available earlier if the board so requests.

The proposal as submitted imposes no specific restrictions upon the university, but contains two significant statements of the donor's desires. Under one of these the regents are asked in selecting the members of the staff of the foundation "to seek and appoint the most competent persons whose services are available, without restriction as to citizenship or race." The other is embodied in the final clause, which reads as follows:

"It is expected that such university funds, or such funds received by the regents from the U. S. Government or other sources, as are available for application to the subject of agricultural economics, will be administered as if they were a part of the income from this foundation or at least in as intimate association with the activities of the Giannini Foundation as existing conditions or restrictions will permit." The evident intent of this provision is to unify or at least coordinate the agricultural economics work of the entire institution, and this is a purpose which appears to be both logical and commendable. Doubtless there will be, however, more or less interest as to the relations which will be developed between the foundation and such existing agencies as the College of Agriculture, and more especially the agricultural experiment station.

With the present endowment, an income of perhaps \$50,000 per annum may be expected for the foundation, but presumably even this large sum is intended to supplement rather than to replace the provision already made for agricultural economics work in California with funds derived from State and Federal sources. Irrespective of this or any similar clause, it would seem that responsibility for expenditures of all Purnell funds and the supervision of all Purnell projects must continue to rest definitely with the experiment station. The same principle would also hold for Hatch and Adams funds, as well as for Smith-Lever funds and projects and the extension service, and the expenditures for resident instruction. A segregation of agricultural economics as something apart from institutional activities in other subjects because of its partial endowment by private benevolence would be a distinct anomaly in a public institution. Fortunately, the administration of the foundation apparently rests exclusively with the board of regents which controls the destinies of the university as a whole, and while it may present some special problems it can hardly be separated from the general situation.

The broad question of private aid to public institutions is one of great importance, and certain aspects will need to be considered with some care if substantial endowments of the State agricultural colleges and experiment stations become at all numerous. Much is

to be said in favor of such gifts when uncomplicated by embarrassing restrictions, and so far as they represent a sincere interest in the promotion of agriculture and rural life they can be wholeheartedly commended as a legitimate and attractive form of public service. The Crabtree, Frasc, and Giannini gifts all seem to meet this requirement. Quite evidently, however, each new offer to a State-supported institution will have to be considered on its own individual merits. This will be especially vital in the case of agricultural research institutions, to ensure that there is involved neither direct nor indirect interference with their complete and impartial functioning as fact-finding and truth-revealing public agencies, for their reputations must at all costs be kept above suspicion in the public mind. Perhaps a study of the economic and ethical questions involved might be profitably included in the survey of the land-grant institutions now in progress. The question might be also looked into by the Committee on Experiment Station Organization and Policy of the Association of Land-Grant Colleges and Universities, and its consideration in one or more addresses before the association might prove enlightening and beneficial.

Within the past year frequent reference has been made in these columns to the activities of the Social Science Research Council. This council is made up of three members each from the American Anthropological Association, the American Economic Association, the American Historical Association, the American Political Science Association, the American Psychological Association, the American Sociological Society, and the American Statistical Association. Although of recent organization, it has already proved itself an active and effective agency in stimulating research in the social sciences. One of its best known and most notable achievements has been its sponsoring of studies of the status of research in agricultural economics and rural sociology, discussed in connection with the Washington meetings of economics and sociological workers, and still in full progress along lines which give every promise of valuable findings.

Recently announcement has been made regarding another project in which the council has been much interested and which is now apparently soon to be brought into active being. This is the establishment of a *Journal of Social Science Abstracts*. Funds have been placed at the disposal of the council aggregating \$500,000 to finance this venture during the initial period of 10 years. Not more than \$65,000 is to be available in any one year, and the hope is expressed that at the end of the decade the journal will become mainly if not wholly self-supporting. A comparatively low subscription rate is contemplated as a means to this end.

The object of the proposed journal is to "bring together for the use of men interested in research in economics, political science,

sociology, statistics, and history citations and adequate abstracts of significant publications in all countries, both factual studies and contributions to theory. It will include also such materials from cultural anthropology, psychology, human geography, and other related fields as are of interest to scholars in the fields first mentioned."

The management of the journal is to be in the hands of a corps of salaried editors, giving full time to the enterprise. Publication is to be in English, but tentative steps are announced to secure an exchange of abstracts with agencies doing work in other countries. A monthly publication is planned, and it is estimated that from 15,000 to 25,000 abstracts are to be expected the first year.

The scope of such a journal obviously far transcends the boundaries of agricultural economics and rural sociology, but it may be expected that in view of the keen interest which has been shown in these branches by the council their interests will receive due consideration. This is very desirable, for in the past workers along these lines have had more or less difficulty in following the literature in directions in which they are broadly concerned. *Experiment Station Record*, to be sure, established a section of rural economics in 1905 in charge of Dr. H. C. Taylor, then a specialist in the Office of Experiment Stations, and in 1921 the title of the section was amplified to give specific recognition to rural sociology. However, the space limitations prevailing since 1911, when research along these lines was still in its infancy, have precluded very much expansion as these subjects have been developed, and abstracts not exceeding in number 400 or 500 per year are about all that can be hoped for under existing conditions. Under the basic policy of the *Record*, the publications of the experiment stations and the Federal Department of Agriculture and contributions from their workers to journals and other outside publications are abstracted systematically, though not always as fully as users desire, but there is little space available for the constantly growing volume of foreign work and other articles of direct bearing.

Under any conditions the large number of publications of more general interest could hardly find admission in an abstract journal specializing so closely in agriculture and home economics as does the *Record*. Yet there are many pieces of research, as well as a host of other articles outside the narrow confines of these subjects, with which every investigator in agricultural economics and rural sociology should be acquainted. It therefore seems fortunate that provision for greater assistance in this direction will soon be forthcoming. An abstract journal covering the broad reaches of the social sciences systematically and completely should be able to render a very useful service and have before it a unique and appealing opportunity.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A new method of stating hydrogen-ion (hydrion) concentration, E. T. WHEREY (*Wagner Free Inst. Sci. Phila. Bul.*, 2 (1927), No. 2-3, pp. 59-64).—Pointing out as objections to the use of the pH scale in presenting quantitative data with respect to effective acidity or effective alkalinity for the use of non-scientific readers (1) its reversal of the order of numbers employed in all ordinary methods of measurement, the lower numbers representing the higher acidities and vice versa; and (2) the logarithmic, rather than the arithmetical, character of the pH scale, the author presents, as better adapted to popular use, the self-explanatory system shown in the accompanying table:

Comparison of methods of stating reactions

pH	Active acidity	Descriptive term	pH	Active acidity	Descriptive term	pH	Active alkalinity	Descriptive term	pH	Active alkalinity	Descriptive term
3.0	10,000		3.0	10,000		7.0	0.0	Neutral.	7.0	0.0	Neutral.
0.1	8,000	Superaacid.	0.1	80	Subacid.	0.1	0.5	Minimalkaline. Low.	9.0	100	Medialkaline. Low.
.2	6,300	High.	.2	63	High.	.2	1	Circumneutral. High.	.1	125	High.
.3	5,000		.3	50		.3	1.5		.2	160	
.4	4,000		.4	40		.4	2		.3	200	
.5	3,150		.5	31.5		.5	3		.4	250	
.6	2,500		.6	25		.6	4		.5	315	
.7	2,000	Low.	.7	20	Low.	.7	5		.6	400	
.8	1,600		.8	16		.8	6		.7	500	
.9	1,250		.9	12.5		.9	8		.8	630	
4.0	1,000		6.0	10					.9	800	
.1	800	Mediacid.	.1	8	Minimacid.	8.0	10	Subalkaline.	10.0	1,000	Superalkaline. Low.
.2	630	High.	.2	6	High.	.1	12.5	Low.	.1	1,250	
.3	500		.3	5		.2	16		.2	1,600	
.4	400		.4	4		.3	20		.3	2,000	
.5	315		.5	3		.4	25		.4	2,500	
.6	250		.6	2		.5	31.5		.5	3,150	
.7	200	Low.	.7	1.5	Circumneutral. Low.	.6	40	High.	.6	4,000	High.
.8	160		.8	1.0		.7	50		.7	5,000	
.9	125		.9	.5		.8	63		.8	6,300	
5.0	100					.9	80		.9	8,000	
			7.0	.0	Neutral.				11.0	10,000	

"Two sets of numbers are thus made available—pH for those who can use logarithms in mental calculations, active acidity and alkalinity values for those who prefer arithmetic. There is a third class of users who are not interested in any numbers. For them, the final column in each half of the table has been provided."

Osmotic pressures of concentrated solutions, W. D. BANCROFT and H. L. DAVIS (*Jour. Phys. Chem.*, 32 (1928), No. 1, pp. 1-43).—This is an extensive theoretical discussion which introduces into the derivation of the equations employed in dealing with osmotic pressures "certain factors which are not

represented in the simple equation $PV=RT$, and thus produces a formulation which is nearer the truth." The expressions arrived at are

$$PV_s = \frac{RT}{M_s} \ln \frac{p_0}{p_1}$$

in which p_0 and p_1 are the vapor pressures of the pure solvent and of the solution, respectively; R , T , and P have their customary significances; V_s is equal to the volume of 1 gm. of the solvent in the solution; and M_s is the molecular weight of the solvent in the vapor (not in the liquid) state; and

$$PV_i = RT \frac{N}{n} \ln \frac{p_0}{p_1}$$

in which V_i is the volume in the solution of that mass of the solvent which contains 1 mol of the solute, N equals mols of solvent considered as converted into vapor, and n equals mols of solute in the solution. These two expressions are considered to be equivalent and to approach true values for osmotic pressures much more closely than does the simpler expression $PV=RT$.

Numerous other conclusions are presented.

A specific reagent for sodium [trans. title], J. M. KOLTHOFF (*Ztschr. Analyt. Chem.*, 70 (1927), No. 10-11, pp. 397-400).—A reagent is prepared by mixing warm solutions of uranyl acetate 10 gm., 30 per cent acetic acid 6 gm., and water to make 50 gm., and zinc acetate 30 gm., acetic acid 3 gm., and water to make 50 gm., allowing the mixture to stand until the next day, and filtering from any precipitate of sodium uranyl zinc acetate. It was found that sodium in a concentration of 100 mg. in 1 liter gave an immediate precipitate, 50 mg. per liter giving a precipitate after 5 minutes standing, 25 mg. after 10 minutes, and 20 mg. in 0.5 hour. The method is very suitable for a sensitive test for sodium in potassium salts. The concentration of the potassium salt should correspond to not more than 5 gm. of potassium in a liter to avoid the precipitation of the potassium salt. Two cc. of 1 per cent solution of the potassium salt are mixed with 2 cc. of the reagent and 2 cc. of 96 per cent of the alcohol and allowed to stand 0.25 hour. The reaction in these conditions is still more sensitive than in pure aqueous solution.

Colorimetric micromethod for the determination of sodium [trans. title], H. K. BARRENSCHEEN and L. MESSINER (*Biochem. Ztschr.*, 189 (1927), No. 4-6, pp. 308-313).—Following a cursory citation of a number of methods dependent mostly on the precipitation of sodium either as the pyroantimonate or as sodium caesium bismuth-nitrite, the authors present as an accurate and sensitive microcolorimetric method the following procedure, based in part on Kolthoff's observation (above noted) of the sensitiveness of the reaction of the precipitation of sodium uranyl-zinc-, or sodium uranyl-magnesium-acetate:

Prepare the precipitant from uranyl acetate and zinc acetate as described by Kolthoff above. Mix these solutions warm, preferably permit them to stand over night, and filter from any sodium precipitate which may be formed. The reagent may be preserved in sodium-free glass without further precaution. Further reagents required are 96 per cent alcohol, 50 per cent alcohol, 10 per cent acetic acid, and 20 per cent potassium ferrocyanide; and, for the removal of protein and inorganic phosphates from samples of biological fluids, a saturated alcoholic solution of zinc acetate. A standard sodium solution containing 254.17 mg. of the purest possible sodium chloride per liter is also used, 1 cc. of this solution corresponding to 0.1 mg. of sodium. A few cubic centimeters of chloroform should be added to protect this solution from bacteria and molds.

For pure solutions of salts proceed as follows: Pipette 1 cc. of a sample solution into a graduated small centrifuge tube of Jena glass, and treat with 3 cc.

of 96 per cent alcohol and 2 cc. of the precipitant, mixing thoroughly. Treat 1 cc. of the standard sodium solution in the same way. After 0.5 hour standing, centrifuge 5 minutes, and pour off the supernatant liquid as completely as possible, removing drops adhering to the side of the tube with a clean cloth. Add 3 cc. of 50 per cent alcohol, washing down the sides of the tube all around, and centrifuge 3 minutes. Pour off as completely as possible the last washing alcohol, and bring the bright yellow precipitate into solution by adding 0.5 cc. of the dilute acetic acid to a few cubic centimeters of water, transferring the solution quantitatively with repeated washings into a volumetric flask. Make up the standard solution to 50 cc., diluting the precipitate from the sample solution in proportion to the relative volumes of the precipitates as noted in the graduated centrifuge tube. After filling to the mark, add 0.5 cc. of the 20 per cent ferrocyanide solution to each 50 cc. of the redissolved precipitate. After thorough mixing allow the solution to stand 2 or 3 minutes, then make the color comparison.

A table of test determinations performed by this method is presented to indicate its degree of accuracy. A form of the procedure applicable to biological fluids and involving the use of the saturated alcoholic zinc acetate for the precipitation of proteins and inorganic phosphates is also detailed.

Contribution to the study of the so-called potassium chlorate method for the determination of manganese [trans. title], M. MARQUEYROL and L. TOQUET (*Ann. Chim. Analyt.*, 2 ser., 9 (1927), No. 11, pp. 324-330).—Following the report of a number of further test determinations of manganese, both in samples made to certain known quantities of the metal and in samples of such materials as steel, manganese bronze, ferromanganese, etc., this concluding part of the authors' report (*E. S. R.*, 58, p. 310) on the conditions necessary to make accurate and dependable the determination of manganese by precipitation as the dioxide from nitric acid solution by the addition of potassium chlorate, presents conclusions and recommendations, and the following procedure, specified for the analysis of manganese bronzes, spiegels, and ferromanganese:

Place the sample of the alloy in a lipped beaker flask of a capacity of 250 cc., dissolve in 50 cc. of nitric acid of a density of 36° B. Heat on a sand bath to disappearance of red fumes, and after cooling add 2 gm. of crystallized potassium chlorate for samples containing not over 0.1 gm. of manganese or 3 to 4 gm. of potassium chlorate for samples containing 0.1 to 0.2 gm. of manganese. Shake without heating until almost the whole of the chlorate is dissolved, then place the flask on a water bath carrying a plate 2 or 3 mm. less in diameter than the diameter of the flask. Cover the flask with a watch glass and heat the water bath to vigorous boiling, continuing the heating for 2 hours and shaking from time to time during the first 10 minutes, remove the flask and allow it to cool, then add 120 cc. of distilled water. Shake, and after allowing to stand for a few minutes filter on a plain filter 90 mm. in diameter, pouring the precipitate on the filter and rinsing 4 times with distilled water without disturbing the manganese dioxide adhering to the walls of the flask. Wash with distilled water until a cubic centimeter of the filtrate shows no color with recently prepared starch potassium iodide paste. Place the funnel with the paper on the flask in which the manganese was precipitated, puncture the paper with a pointed glass rod, and wash as much as possible of the manganese dioxide from the filter. The manganese dioxide can not be completely removed from the filter, and this also is washed into the flask. Add 20 cc. of a cold diluted sulfuric acid solution containing 500 gm. per liter of sulfuric acid of 66° B.; shake; add an exactly measured volume (30 to 50 cc.) of pure, approximately $N/5$ hydrogen peroxide (prepare this by diluting pure

10 volumes of hydrogen peroxide with 8 to 9 times its volume of distilled water); and shake. Continue shaking gently until the manganese dioxide is entirely dissolved (5 to 10 minutes). Complete the determination by titrating the excess of hydrogen peroxide with $N/10$ potassium permanganate. It is noted that to secure rapid solution of the manganese dioxide enough hydrogen peroxide must be used so that the excess corresponds to at least 20 cc. of the $N/10$ potassium permanganate. It was found that the presence of the filter paper in the reaction mixture in no way affected the results. It is also considered possible to titrate the manganese with oxalic acid.

As advantages of the chlorate method the author notes its applicability to comparatively large weights of metal; the elimination of empirical constants from the calculation of the results; and the fact that it is always possible to verify the completeness of the precipitation of manganese.

A simple colorimetric method for field determinations of the carbon dioxide tension and free carbon dioxide, bicarbonates, and carbonates in solution in natural waters, I, II (*Ecology*, 8 (1927), Nos. 3, pp. 333-338; 4, pp. 471-479).—The first of these two papers, entitled A Theoretical Discussion, by E. B. Powers, discusses the physicochemical and mathematical theory of a method depending on the colorimetric estimation of the pH value and the calculation, in the absence of chemical interfering factors other than carbon dioxide, carbonates, and bicarbonates, of the carbon dioxide tension from the relation $\log C_H = n \log (Kk_{s+s}P)$, in which since $pH = -\log C_H$, the pH values, with the addition of the minus sign, can be inserted from the results of the colorimetric measurement, n being understood to be the power of the rate of increase of C_H , and $k_{s+s}P$ the solubility product of H_2CO_3 . The equation $C_H = (Kk_{s+s}P)^n$ is, then, the mathematical power law representing the relation of the C_H to the carbon dioxide tension of all equilibria, the above linear form being obtained simply by taking the logarithm of both sides of the equation.

Values of n in various water supplies, together with other data in support of the accuracy and suitability of the method, are presented in the second paper, A Critical Mathematical Analysis of Theory and Data, by Powers and J. D. Bond.

A quantitative micromethod for the fractionation of the serum proteins by electrodialysis [trans. title], A. TóTH (*Biochem. Ztschr.*, 189 (1927), No. 4-6, pp. 270-293, figs. 12).—The claim is made for the apparatus and procedure figured and described that separations with a quantitative recovery of the separated fractions of the proteins in samples of 1 cc. or less of serum may be secured. The apparatus, procedure, and experiments directed to the choice of suitable membranes for the electrodialysis are described at some length. Double collodion membranes are recommended for quantitative purposes, while for preparation work chrome-gelatin membranes are considered better. Numerous experimental data and conclusions are presented.

The influence of salts on the optical rotation of gelatin, I, D. C. CARPENTER (*Jour. Phys. Chem.*, 31 (1927), No. 12, pp. 1873-1879, fig. 1).—Following a brief review of related literature, this contribution from the New York State Experiment Station reports experiments on the effect on a high-grade calfskin gelatin, rendered ash-free by electrodialysis at its isoelectric point (pH 4.7), of the addition in various concentrations of potassium chloride, potassium bromide, and potassium iodide with respect to specific rotation as measured at pH 6.0 (quinhydrone electrode) and under various conditions of time and temperature. It is considered that the gelatin exists in solution at the pH value (6.0) at which these experiments were conducted, in the form of gelatinates; in the present case, potassium gelatinate.

It was found that the three salts produced a characteristic lowering of the optical activity of the 0.7 per cent potassium gelatinate, potassium iodide having the greatest effect, potassium bromide giving an intermediate result, and potassium chloride the least change. These changes in optical activity are attributed to a tautomeric equilibrium between the gel and sol forms of gelatin, and to changes caused by the added halide salts in the hydrol equilibrium of the solvent.

Judging sugar by taste [trans. title], A. A. RIKHTER [RICHTER] (*Zhur. Opytn. Agron. Tugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands)*, 3 (1927), No. 2, pp. 101-106).—Various concentrations of solutions of glucose, sucrose, and fructose were prepared in the same manner, placed in beakers, and 10 cc. of each tasted, the presence, absence, or doubt of presence of sugar being recorded. From these data the ratio of sweetness was estimated as follows: Fructose 100, sucrose 66, glucose 45.

The separation of trypsin from enterokinase by ultrafiltration [trans. title], H. BECHHOLD and L. KEINER (*Biochem. Ztschr.*, 189 (1927), No. 1-3, pp. 1-17).—It was found possible to separate the enzyme from its associated activity substances by ultrafiltration through collodion membranes. A 4 per cent glacial acetic acid collodion membrane sufficed to hold back the enterokinase completely, while the trypsin was able to pass a 10 per cent membrane. The ultrafiltrate was without enzymic activity, and the material retained by the filter showed only such activity as was considered attributable to adsorption. Reuniting the ultrafiltrate and nonfiltrable residue effected a complete reactivation of the trypsin.

It is concluded that the colloidal particle of enterokinase is larger than that of albumin or of hemoglobin, while trypsin must be extremely finely dispersed, approaching the condition of a semicolloid, if it is not indeed a crystalloid. In the partition of the trypsin solution by ultrafiltration, the salts, protein breakdown products, and the like pass through the membrane with the trypsin, leaving the enterokinase free from carbohydrates, protein breakdown products, etc., and nearly free from ash (0.0 to 0.3 per cent). This residue of protein and enterokinase was found to constitute 2.8 per cent of the original crude trypsin, so that the enterokinase must constitute, according to this result, much less than 2.8 per cent of the crude trypsin.

It was further found that, by adding potassium hydroxide to neutrality or weak alkalinity, the degree of dispersion of the enterokinase fraction could be so far increased as to permit it, also, to pass through a protein-impermeable membrane. A number of other experiments with the filtrates and residues obtained in ultrafiltrations of trypsin are also described.

Some of the factors which influence the composition of cabbage and their relation to the quality of sauerkraut, W. H. PETERSON, H. B. PARMELE, and E. B. FRED (*Soil Sci.*, 24 (1927), No. 5, pp. 299-307).—This is a contribution from the Wisconsin Experiment Station reporting the effect in the growing and subsequent treatment of cabbage of a number of such conditions as soil type, age at harvesting, temperature, and duration of storage upon the quality of sauerkraut made from several varieties of cabbage. Moisture, total nitrogen, amino nitrogen, reducing sugars as glucose and sucrose, and total and water-soluble calcium and total and water-soluble phosphorous were determined on the fresh cabbage, all samples analyzed being subsequently made into sauerkraut by methods of the usual commercial type. The quality of the product was judged on the basis of titrable acidity calculated as lactic acid, taste, color, texture, and a general grading. Data in relation to the soil types on which the cabbage was grown, its variety, the date of cutting, and the conditions of the storage are tabulated for each of the 12 samples of cabbage dealt with.

It was concluded in part that better sauerkraut is made from late than from early cabbage, from the upland soil crop than from that grown on marsh soil, and from firm, compact heads than from looser heads. Low temperature, storage, and slight freezing had little, if any, effect on the quality of the sauerkraut, but severe freezing or storage at high temperatures seemed likely to yield poor sauerkraut. Freezing before cutting appeared to change sugar into other carbohydrates.

The inorganic constituents, nitrogen compounds, and carbohydrates of cabbage were found to be influenced by soil type, cabbage grown on marsh soil containing more nitrogen and less sugar than that from upland soil.

About one-half of the nitrogen of the cabbage samples was found water-soluble, about 60 per cent of this being amino nitrogen. About 85 per cent of the total sugar in the cabbage studied consisted of reducing sugars and the remaining 15 per cent of sucrose.

The yeast of sauerkraut [trans. title], A. A. BACHINSKAYA (BATCHINSKY) and G. K. BUGVITS (BUGWITZ) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 59-67, figs. 10).—From an extensive study on sauerkraut the following conclusions were drawn: (1) The pickling of cabbage for sauerkraut is a process of the combined activities of bacteria and yeasts. (2) Bacteria were found in all samples at the time of making the sauerkraut and throughout the process of fermentation; yeasts were found only in the beginning and in the upper layers. (3) The cabbage juice obtained through salting and pressure in the first stage of making sauerkraut is a favorable medium for yeasts. With the accumulation of lactic acid and decrease of carbohydrates and proteins a depression of the yeasts takes place, and finally they disappear, especially from the deeper layers. (4) The yeasts are *Saccharomyces brassicae fermentatae* and *Torula*; *Monilia* and *Mycoderma* were also found. (5) In the early stages of fermentation the acid formed by the yeasts is not injurious, but upon the destruction of the acid a favorable medium for the decay bacteria is formed, and this is injurious to the process of fermentation. (6) With 1.5 per cent salt the number of yeast organisms is greater than when 3 per cent salt is added. With the latter the yeast numbers decrease rapidly, and they quickly disappear.

SOILS—FERTILIZERS

The latest accomplishments in the realm of soil science in the Union of Socialist Soviet Republics and other countries [trans. title], K. D. GLINKA (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 6-23).—The author discusses the following subjects: (1) The organic fraction of the soil (humus); (2) the mineral fraction of the soil; (3) the studies of the properties of the soil mass—mechanical composition, petrographic make-up, chemical composition, physical properties, moisture relationships, and absorbing capacity of soils; (4) soil acidity; (5) soil air; (6) the soil solution; (7) soil classification; (8) the study of soil types in nature; (9) the mapping of soils; (10) the study of soil dynamics; and (11) microflora and microfauna of the soil. The most important recent papers on the subjects enumerated above are briefly reviewed and discussed.

The dynamics of the physicochemical processes in the soil [trans. title], S. I. BUNTJAKOV (S. J. BUNTJAKOV) (*Zhur. Opytn. Agron. Tugo-Vostoka (Jour. Expt. Landw. Sudost. Eur.-Russlands)*, 3 (1927), No. 2, pp. 60-74, figs. 2; *Eng. abstr.*, p. 171).—Summarizing the results of experiments, the author states the following conclusions: (1) The influence of tillage is definitely expressed in the intensity of the process of nitrification; tillage has little or no influence on

the mobilization of other nutrients. (2) The porosity of the plowed soil drops toward autumn; the greatest porosity was noted in the chernozem soils, followed by the columnar solonetz and finally the dark-chestnut and sandy soils. (3) Favorable conditions for the accumulation of nitrates are from 60 to 66 per cent aeration, 23 to 26 per cent of moisture, and 17 to 22° C. temperature. (4) Fallowing a soil increases the amount of nitrates three times over that of a soil left undisturbed; spring crops increase the nitrates only twice. (5) With a May fallow the maximum accumulation of nitrates takes place in July, with spring crops in June. (6) The changes in the amounts of nitrates in various types of soils under conditions of uniform tillage are about alike and may be expressed by identical curves. (7) Under conditions of uniform tillage in various types of soils the maximum accumulation of nitrates is quantitatively alike and is to be noted during the month of June. (8) Spring wheat exerts a strong influence on the amounts of nitrates and lime; in respect to other nutrients its influence is negligible. (9) The greatest loss of nitrates under spring wheat takes place on chernozem and dark-chestnut soils; little less on the columnar and sandy soils. This phenomenon is especially marked on all soils at the time of forming the straw.

Soil reaction and plant growth [trans. title], W. MEVIUS (*Naturw. u. Landw. [Freising]*, No. 11 (1927), pp. 153, figs. 10).—Noting the progress from the rather loose concepts with respect to "reaction" current at the time of the publication of Michaelis's treatise in 1914 (*E. S. R.*, 32, p. 801), to a widespread use of more exact methods and terminology, the author states the purpose of the present monograph to be the presentation of the modern view of the importance of soil reaction for plant life on the basis of the numerous investigations which have appeared up to and including 1925. Work not available to the author until 1926 is briefly treated in an appendix.

Following an historical introduction (pp. 6-13), the contents are as follows: H-ion concentration (pp. 13-18), presenting the fundamental theory of the relation of hydrogen and hydroxyl ions in aqueous solutions, and an explanation of the pH scale and its relation to the actual normalities of C_{H^+} and of C_{OH^-} in aqueous solutions, together with Wherry's notation (*E. S. R.*, 41, p. 205) of H-ion concentrations, etc.; methods for the determination of H-ion concentration (pp. 18-27); soil reaction and its determination (pp. 27-39); plant distribution and soil reaction (pp. 39-46); growth experiments dependent on the reaction of nutrient media (pp. 46-63); the indirect influence of the H-ion concentration of the nutritive substratum upon plants (pp. 64-92); the direct effect of H-ion concentration upon plant cells (pp. 92-113); the influence of living plants on the reaction of the nutritive substratum (pp. 113-119); appendix (pp. 120-125); and references (pp. 126-153).

The pH value of some Texas soils and its relation to the incidence of certain woody plant species, A. H. BERKMAN (*Soil Sci.*, 25 (1928), No. 2, pp. 133-142).—Colorimetric pH determinations were made on soil extracts, prepared according to Plerre's method (*E. S. R.*, 55, p. 213), from samples taken at various depths in a number of types of soil found in the Bastrop region in the vicinity of the University of Texas. Having established the safety of clarification by neutral washed carbon black, the author supplemented in some cases the extraction method above noted by the filtration of the extracts with the help of purified carbon black, obtaining thereby "fairly clear" solutions.

From the data thus obtained, taken in conjunction with the types and relative proportions of the various timber species found on the soil areas examined, the following observations are recorded: *Pinus taeda* was found a dominant in soils of the areas studied where the pH value was 6.7, while in the same areas

at pH 6.5 *Quercus stellata* and *Q. marylandica* dominated. In a comparison of the above reported results in the Bastrop region with those obtained in other areas dominated by *Q. stellata* and *Q. marylandica* a pH value of about 6.5 is indicated as favoring the dominance of these species. *Q. stellata*, *Q. marylandica*, *Sabina sabinoides*, and *Ulmus crassifolia* appear to occur as dominants at pH values of 6.5, 6.5, 7.5, and 7.8 to 7.9, respectively.

"In general, the results obtained in this investigation seem to indicate that the soil reaction exerts a selective influence on plant species, but more data taken at different seasons of the year and over a period of years are necessary before definite conclusions can be drawn."

A study of base exchange in soils with the aid of the quinhydrone electrode, F. O. ANDEREGG and R. P. LUTZ (*Soil Sci.*, 24 (1927), No. 6, pp. 403-412, figs. 2).—Following the development of formulas for base exchange in soils and in similar systems, the equilibrium constant being shown to be a function of the ionization constants of the combination between the base ions and the clay, report is made of titrations of an acid clay suspension with solutions of salts in the presence of the quinhydrone electrode, the data of these experiments on substitution in several equations above noted apparently showing "sufficient accuracy to warrant certain conclusions in spite of the multiplication of the experimental error during the computations." The conclusions presented included the following:

(1) According to the evidence adduced, the base ions replace only one hydrogen from each clay "molecule," the clay behaving like a monobasic acid in contact with the solutions of neutral salts used. (2) The molecular weight of the clay is probably about 3,500 when oven-dried or about 3,900 when dried in a desiccator at ordinary temperatures. (3) The calculated ionization constants for the sodium, potassium, magnesium, and calcium salts, respectively, of the clay used are represented by the figures 1.70, 1.15, 0.73, and 0.76, each multiplied by 10^4 .

The effect of dehydration of soils upon their colloid constituents, I, J. L. STEENKAMP (*Soil Sci.*, 25 (1928), No. 2, pp. 163-182, figs. 7).—Following a very brief historical introduction noting the long-existent practice of drying or burning the soil, and a review of the more representative literature showing a lack of data on the effect specifically on the colloids of the drying out of soils, the author presents a report of experiments directed to the physicochemical effects of drying upon the soil colloids.

It is concluded in part that the drying of a soil generally increases the solubility of inorganic as well as organic substances, this increase bearing some relation to the temperature of heating. The maximum of soluble constituents was found after heating at about 250° C., higher temperatures causing a decrease in the total salts recovered. The greatest response from drying a soil has been obtained in the case of plants which under natural conditions thrive in soils not subjected to a drying influence in tillage. The data obtained are believed to show that the effect on fertility is traceable to physical, chemical, and biological causes, or combinations of these. Drying is considered to be a powerful factor in the transformation of fertility elements of soils from a potential to an active form.

The significance of the soil solution for plants [trans. title], S. P. KRAVCOV KRAVCOFF (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 41-47).—The author discusses the following properties of the liquid phase of the soil system: (1) Osmotic pressure: The influence of its increase or decrease on the growth of the plant, its part in the absorption of nutrients, the optimum pressure for normal growth, and methods of regulating the pressure; (2) the degree of electrolytic dissocia-

tion of the compounds which make up the soil solution; (3) the H-ion concentration of the soil solution; (4) stimulating substances; and (5) the quantitative relationship among the nutrients found.

Phosphate in the soil solution as affected by reaction and cation concentrations, L. J. H. TEAKLE (*Soil Sci.*, 25 (1928), No. 2, pp. 143-162, figs. 3).—Noting the rather wide divergence of result and opinion arising from the differences in the soil and climatic conditions under which various observers have studied the behavior of phosphatic fertilizers in soils, the author infers that "a more intimate knowledge of soil chemistry and of the behavior of the various phosphates under the conditions met with in soils should satisfactorily answer the questions involved and harmonize the interpretations of field and laboratory results."

He states that the purpose of the experiments here reported is to show the importance of the reaction of the medium and of the cations associated with the phosphate in the soil within the usual range of acidity or alkalinity in studying the nature of the phosphatic compounds occurring in the soil. The solubility of phosphates in aqueous solutions at various reactions, and in soils under the influence of water, hydrochloric acid, sulfur, and ammonium oxalate, was investigated, the following being among his conclusions: (1) Iron phosphate is least soluble at pH 3, ferric hydroxide being precipitated with a liberation of phosphate ions under less acid condition. (2) The phosphates of manganese and aluminum are least soluble under slightly acid conditions, manganic oxide being precipitated with the liberation of phosphate as the reaction becomes alkaline, while under the same conditions aluminum phosphate yields aluminate ions and phosphate ions. (3) Calcium phosphate is insoluble under alkaline conditions. (4) Calcium phosphate solubility is depressed mainly by, first, the calcium ion, and second, excess calcium ion in the presence of hydroxyl ion. Hydroxyl ion alone probably causes the formation of a basic phosphate liberating some phosphate ions.

Retention of phosphorus by soil colloids, C. A. ROSZMANN (*Soil Sci.*, 24 (1927), No. 6, pp. 465-474, figs. 5).—On the basis of a series of determinations of the phosphorus absorption of electrodyalyzed colloidal clay at various pH values, it was found that such clay, in the presence of calcium or sodium ions, absorbed a maximum proportion of phosphate at a pH value of from 3 to 4, the calcium clay absorbing 1.5 times as much phosphorus at the pH of maximum effect as did the sodium clay. The absorption per gram was practically the same whether 1, 2, or 3 gm. of sodium clay was present at a given phosphate concentration. The maximum absorption occurred in the pH range of greatest solubility of the iron and aluminum, the conclusion being drawn from this observation that these elements are not concerned in the absorption, and "it was not due to the formation of insoluble calcium salts because the soluble phosphorus only was considered." Organic matter was dissolved in the case of the sodium clay as the phosphorus absorption decreased, this effect being considered to indicate the possibility of retention by the organic fraction.

The recent tendencies in the realm of investigations on the microbial forces in the soil [trans. title], V. L. OMEL'ANSKIĖ (OMELIANSKY) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 1-6).—This is a review of the newer knowledge on soil microbiology.

A study of the protozoa of some American soils, H. SANDON (*Soil Sci.*, 25 (1928), No. 2, pp. 107-121, figs. 6).—The work here reported, the greater part of which was carried out at the New Jersey Experiment Stations on the experimental agronomy plats, consisted mainly of determinations of the protozoal

numbers by Cutler's dilution method (E. S. R., 44, p. 126); identifications of many protozoa; counts of the bacteria, Actinomyces, fungi, etc. Some similar work was carried out in the vicinity of the Utah Experiment Station. In addition to the counts, a total of 71 protozoan forms identified are listed, these including 25 flagellates, 23 rhizopods, and 23 ciliates.

On the basis of this investigation, the author is of the opinion that the protozoan fauna is very similar in all soils, the numbers of these organisms being roughly related to those of the bacteria. It is considered that the errors of the dilution method all tend to make the count low rather than high, and the results obtained by using a soil medium in place of the ordinary nutrient agar are pointed out as suggesting that modifications of technique may reveal in all soils a larger population than has thus far been recognized. An appendix describes in detail *Dimastigella trypaniformis* n. g. and n. sp., together with some other of the organisms isolated.

The production of pyruvic acid by certain nodule bacteria of the Leguminosae, J. A. ANDERSON, W. H. PETERSON, and E. B. FRED (*Soil Sci.*, 25 (1928), No. 2, pp. 123-131).—Xylose, glucose, sucrose, lactose, and mannitol were found to be fermented by two strains of the root nodule bacteria of alfalfa. The fermentations were slow and yielded acid equivalent to about 5.5 per cent of the sucrose and about 7.3 per cent of the lactose fermented. From colorimetric tests, the iodoform reaction, the formation of a corresponding hydrazone on treatment with parantitrophenylhydrazine, and the properties of the last-named derivative, and, finally, from quantitative elementary analysis, it was concluded that pyruvic acid is a normal product in the fermentation of carbohydrates by certain root nodule bacteria.

The chemical composition of soil organic matter as related to its effectiveness, F. J. SALTER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 5, pp. 397-409).—Surveying recent work (1916-1925) as represented by a bibliography of 48 citations, the author calls attention to the urgent need still existent for a better understanding of the nature of the soil organic matter, drawing from his analysis of the literature inferences with respect to the effect of soil organic matter as influenced by its chemical composition, in part as follows:

The solubility of some inorganic soil constituents is increased. Increases in the numbers of microorganisms are also brought about, and provided the carbon-nitrogen ratio is narrow the rate of their action is accelerated. The soil organic matter has a buffer action assisting in the regulation of the soil reaction, and it provides colloidal material important in base absorption and exchange, as well as being a determinant in the soil water-holding capacity. According to its carbon-nitrogen ratio the soil organic matter may effect the depression of available soil nitrate by encouraging nitrate assimilation by microorganisms, and may either favor or discourage the accumulation of humus. Toxic compounds may be included in the soil organic matter, though these are considered seldom a factor in well-managed soils. It is finally concluded that the soil organic matter probably does not contain auximones.

Some physical and physico-chemical effects of soil organic matter, B. A. KEEN (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 5, pp. 362-368).—This is an historical and analytical review, covering rapidly its indicated field, from the emergence of agricultural science in a recognizable form at the beginning of the last century to the present time. The paper is accompanied by a bibliography noting some of the earliest work.

Organic matter supplied in crop residues, E. E. DETURK (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 5, pp. 369-380, figs. 3).—Based on experiments with such forms of organic matter supply as farmyard manure in the livestock system,

and, in the grain system, cornstalks, straw of small grains, clover or soy bean straw, second growth clover, and legume green manure crops, this discussion, contributed from the Illinois Experiment Station, presents the following conclusions:

The variability of field soils makes the problem of determining increases in organic matter brought about by treatment a difficult one, requiring great care in selecting similar pairs of plats for comparison. Nonlegume crop residues, including cornstalks and the straw of small grains, decompose fairly rapidly when incorporated in well-drained soils, leaving but a small residuum of inert material to add to the total stock of soil organic matter. This accumulation slowly reaches measureable proportions, the time required depending upon factors not determined. The increases in crop yields resulting from the addition of crop residues are probably due largely to the benefits attending the decomposition of active organic matter rather than to the mass of residual organic matter persisting in the soil.

Organic matter requirements of soils under various climatic conditions, J. C. RUSSEL (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 5, pp. 380-388).—This discussion, contributed from the Nebraska Experiment Station, raises the question whether organic matter is in all cases, or even in any case, an absolute soil requirement. Though the discussion is based on the assumption that "organic matter is a soil requirement under some climatic conditions," the opinion is presented that the restoration of the soil condition of virgin soils rather than the restoration of any particular quantities of constituents may be the important point in attempting to restore the virgin productivity of soils. "In sections where manure is scarce and legumes are expensive to grow, it would seem to be extravagant to attempt to maintain the organic matter content of a soil at a level close to that in virgin land or to build back run-down soil any further than to the point at which crops utilize most profitably all of the nitrogen supplied in the manures." Citations from a bibliography of 20 items furnish the experimental data for the analysis presented.

Soil organic matter and manurial treatments, J. W. WHITE (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 5, pp. 389-396).—From a brief review of the related literature, this paper draws the following among other conclusions:

The diversity of opinion among investigators of the relation between manurial treatments and the maintenance of soil organic matter is due to variations in the methods and conditions of their experiments. The use of lime with manures or with balanced mineral fertilizers compensates by increasing the quantity of the crop residues for a temporary decrease in the soil organic matter resulting from stimulated bacterial action. Chemically equivalent quantities of caustic lime and of neutral carbonate are not distinguishable in their effect on soil organic matter. Mineral nitrogen stimulates the decomposition of soil organic matter more than do nonnitrogenous mineral fertilizers. The importance, however, of phosphates and potash is indicated by the fact that these fertilizers without nitrogen have maintained crop yields and soil organic matter in a grain rotation for 40 years at the Pennsylvania Experiment Station (*E. S. R.*, 50, p. 422).

The relation of organic matter and nitrogen content to series and type in virgin grassland soils, J. C. RUSSEL and W. G. McRUER (*Soil Sci.*, 24 (1927), No. 6, pp. 421-452, figs. 3).—"The purpose of this paper [from the Nebraska Experiment Station] is to show the homogeneity of various soil types in organic matter and nitrogen content, also the differences among series in the same respects. The data presented indicate that certain factors are of outstanding importance in determining organic matter content, and the relation of these factors to soil classification is discussed."

As the basis for this discussion a condensed historical review is presented, together with the results of chemical and physical examinations of a total of 35 types comprised in 18 series. Ten of these series, represented by 15 types, were upland soils; 5 series including 9 types were terrace soils; and the remaining 3 series of 11 types were bottomland soils. In addition to these Nebraska soils, 10 areas of Pratt loam in central Kansas and 5 areas each of the Clarion and Hemsted silt loams in Minnesota were sampled. The hygroscopic coefficient, nitrogen content, and HC:N ratio of these soils in the first and second 6-in. layers are tabulated. Some of the findings presented in the discussion of these data are as follows:

"Texture is the outstanding factor determining nitrogen content in any soil type, and all soil types exhibit considerable variation in texture, therefore they exhibit a corresponding variation in nitrogen content. Textural variations may be expressed numerically in terms of the hygroscopic coefficient, and a calculation of the ratio of hygroscopic coefficient to nitrogen provides a means of eliminating the textural effect on the content of the latter in virgin prairie soils."

On the basis of these observations, "nitrogen homogeneity is to be found in both the first and second 6-in. sections of soil." These and other conclusions "may be applied to organic matter as well as to nitrogen," the two constituents bearing "a fairly constant ratio to each other both in extremes of rainfall and of texture. It must be stressed," however, "that these conclusions have been based on representative samples of Nebraska types, and apply only to virgin grassland soils," though it is believed that they would apply in some degree to other sections of the grassland region. Further discussion and inferences are presented.

Vitamin-like substances in plant nutrition, J. F. BREAZEALE (*Arizona Sta. Tech. Bul. 16* (1927), pp. 399-417, figs. 2).—The author points out that certain plants—notably mustard, tobacco, the legumes, and some others—yield, when decomposed in the soil, substances capable of stimulating plant growth, and concludes that the stimulative value of manure, as shown by experiments with wheat seedlings and both the crystalloidal and colloidal fractions obtained in the dialysis of manure extract, rests "largely in the black, water-soluble organic matter and not in the . . . nitrogen, phosphorus, or potassium that it contains." Save that both dialyzate and nonpermeating residue were lighter in color, experiments of the same type with rotted tobacco stems gave very similar results.

"From observations upon seedlings, it appears that many plants, in order to develop normally, require certain organic compounds in the soil that are not usually considered as plant foods. These compounds are effective in exceedingly small amounts, and they are necessary in plant nutrition because they are one of the factors that have made the plant what it is to-day."

It is further considered that the benefits both of manuring and of crop rotation consist largely in the addition to the soil of vegetable matter which sets free in its decomposition organic compounds, vitamin-like with respect to the exceedingly small quantities in which they are effective, which are essential to the growth of plants.

The relationship between the mineral content of feeds and the soils upon which they are grown (*South Carolina Sta. Rpt. 1927, pp. 50, 51*).—Report is made of progress in the determination in a number of feed crops and in samples taken at various depths from the soils upon which the crops were grown of iron, calcium, magnesium, phosphorus, and iodine. Preliminary results indicate variation of the analysis with the variety and with the place

where the crops were grown, but definite relationships between the fertilizer treatment or the mineral content of the soil and the ash content and composition of the ash of the crop were not demonstrated. Iodine was found in minute quantities in a large proportion of the feeds grown at Clemson College, at Trenton, and at Gaffney, and in a smaller proportion of the samples from Florence and Bishopville. Soy beans were found to contain more iodine than any of the other feeds investigated.

Lessons from the Morrow plats, E. E. DeTurk, F. C. Bauer, and L. H. Smith (*Illinois Sta. Bul. 300* (1927), pp. 105-140, figs. 21).—The practical indications derived from these plats, together with numerous data both in tabular and in graphic form, are presented, and summarized as follows:

"The Morrow plats have been in operation for 52 years and are known as the oldest experimental soil plats in the United States. On one of the plats corn has been grown continuously; on a second plat a rotation of corn and oats has been practiced for the entire period; and on the third a rotation of corn, oats, and clover has been grown for the last 24 years. Results from these three cropping systems without fertilizers are presented from the twelfth year of the operation of these plats through 1926, or for 39 years, and results for the last 23 years are given for the same cropping systems with applications of manure, limestone, and phosphate.

"Crop rotation has noticeably improved the yields over continuous corn growing. The three-year rotation has been more effective than the two-year rotation in maintaining yields over the entire period. The two-year rotation, however, has been gaining on the three-year rotation in recent years because of the influence of sweet clover.

"Clover has been of much benefit in the cropping system, both red clover grown as a hay crop and sweet clover used as a green manure.

"On the untreated land crop yields have steadily declined, not only where corn has been grown continuously, but also in the rotations. The decline is most pronounced, however, under continuous cropping to corn.

"The manure, limestone, phosphate treatment in all three cropping systems has converted a downward trend in yield into an upward trend. The beneficial effect of the treatment has been even more pronounced in the good rotations than on the plat growing corn continuously.

"Throughout the season the crops growing on the treated soil are usually at a more advanced stage of development than those growing on the untreated soil. In corn this shows up at husking time in drier, sounder ears than those found on the untreated land.

"Cropping the land without treatment has used up phosphorus, nitrogen, and other elements, and has resulted in the destruction of organic matter by decay. While these decreases in total amount have been too small to be of great significance, the decrease in active organic matter and the removal of available plant-food elements has been a matter of much importance, being largely responsible for the decline in yielding power.

"By increasing the proportion of active organic matter that can be readily attacked by microorganisms, the crop rotations and soil treatments used have had a marked effect in improving soil conditions for bacterial activity, as measured by the nitrate-production test.

"The practices in rotation and soil treatment which have been the most effective in increasing the crop-producing capacity of the soil have also been the most profitable financially. These better practices not only have increased the yields but they have made possible a greater economy in production, an important factor in increasing farm profits.

"The state-wide application of the better practices used on the Morrow plats, with modifications necessary to suit local conditions, would result in larger acre yields of all crops grown and in reduced production costs. Moreover, the produce from the land would be better balanced in feeding value because of its higher protein content. These changes might reasonably be expected to result in an upward trend in land values and a general improvement in the economic status of the farmer."

Considerations on some soil and manurial problems in Ceylon, I, II, A. W. R. JOACHIM (*Trop. Agr. [Ceylon]*, 69 (1927), Nos. 2, pp. 69-75; 3, pp. 133-140).—These two papers summarize, partly in a more or less popular form, some of the main factors affecting the Ceylonese and other tropical practice of scientific agriculture and soil management, under the following headings: (1) The fixation of atmospheric nitrogen in the soil and the use of legumes in increasing soil fertility, the leaching of fertilizers from soils, the rôle of organic matter in plant nutrition in the Tropics, the decomposition of organic matter in soil, the use of artificial farmyard manure, and organic manures versus artificials; (2) the nature and importance of soil colloids, the soil moisture equilibrium as affected by colloids, absorption of fertilizers by soils, soil reaction—sourness and alkalinity, pan and laterite formation, and the manuring of tropical crops.

Geography of potash needs of soil provinces of the eastern half of the United States, J. N. HARPER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 6, pp. 473-478, fig. 1).—The soil provinces of the eastern half of the United States are tabulated in decreasing order of potash requirement, as follows: Atlantic and Gulf Coastal Plain, Piedmont Plateau, Appalachian Mountains and Plateau, Limestone Valleys and Uplands, Glacial and Loessial, River Flood Plains, and the Great Plains provinces. The regions within these provinces are listed in the same order under the names of the respective provinces, while this classification is further illustrated by a soil province and region-map of the area under discussion. A second table shows the correlation of the principal soil types of the various provinces with respect to their potash needs, these types being divided into six groups. An explanatory discussion accompanies these data. It is noted that most of the soils of the eastern United States require potash for profitable crop production.

Relative crop response to potash, B. L. HARTWELL (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 6, pp. 479-482).—This discussion is based upon the author's previous reports on the grouping of crop plants according to their potash response (*E. S. R.*, 48, p. 518; 54, p. 17), and on the adaptation of proportion of the ingredients of fertilizers suited to such groups,¹ together with a tabular arrangement of certain crops according to their increasing potash response. It is noted that in the experiments cited the various crops were grown under the same conditions, so that their relative responses to potash fertilization are comparable, though the conditions and consequently the results are in some instances at variance with the customary growth conditions and results.

Potash in relation to quality of crop, G. L. SCHUSTER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 6, pp. 506-517).—Noting that only a comparatively recent excessive production of certain crops has influenced experimental work on fertilizers in the direction of quality, rather than quantity, production, the author cites, for a general discussion of such external quality-controlling factors as climate, soil, fertilizers, and husbandry, the crop quality symposium of the American Society of Agronomy (*E. S. R.*, 56, pp. 33, 34, 39), and proceeds to a discussion, with numerous citations, of the effects of various forms

¹ *Jour. Amer. Soc. Agron.*, 17 (1925), No. 1, pp. 68-72.

and methods of application of potassium compounds to potatoes, sugar crops (cane, beets), grain crops, tobacco, and soy beans. Some inferences drawn from this analysis of the literature are as follows:

Potash is important in producing desirable qualities in all the crops above mentioned, though the evidence is not clear in every case with respect to the form of potash which produces the best results, the presence or absence of an adequate supply of potash in the soil being a necessary subject of consideration in every case. Conflicting results in many cases may be due to impurities and to variation in the type and proportion of impurities in the potash fertilizer. Failure of a potash addition to produce a high quality product may be due to the use of a potassium salt the acid radical of which is inhibitive to the proper growth and development of the plant, as in the case of tobacco for smoking purposes. It is noted that the data here analyzed are derived from experiments with various soil types, the properties and reactions of which are not the same, and the influence of such variations upon the crop quality resulting from varying types of potash treatment are discussed.

The influence of liming on the availability of soil potash, W. H. MACINTIRE, W. M. SHAW, and K. B. SANDERS (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 6, pp. 483-505, figs. 5).—The results of laboratory interchange studies have led to unjustified assumptions with respect to the liberation of potassium by calcium in soil liming practice, according to this report on lysimeter experiments from the Tennessee Experiment Station. The evidence here cited is considered to indicate that while a neutral salt of calcium may liberate potassium to the leachings of an acid soil, the reverse effect results when supplementary additions of calcium or magnesium oxides are made. Among other inferences drawn from these experiments is the view that one of the values of liming consists in the conservation of soluble potash additions in a form most probably available to plants yet resistant to excessive loss through normal leaching.

The fate of fractional incorporations of burnt lime in two soil zones, W. H. MACINTIRE (*Soil Sci.*, 24 (1927), No. 6, pp. 475-485, figs. 4).—This contribution from the Tennessee Experiment Station reports and discusses the results of 4-year lysimeter tests of the calcium losses from applications of $\frac{1}{8}$ -, $\frac{1}{4}$ -, $\frac{1}{2}$ -, and 1-ton additions of calcium oxide incorporated both in the surface and in the subsurface layers of the soil.

Calcium losses from the 250- and 500-lb. calcium oxide additions to both layers were practically the same as the loss from the untreated soil. The differences in result between applications to the surface and to the subsurface layers were especially marked in the case of the $\frac{1}{2}$ -ton and 1-ton rates of application, the loss from an application of $\frac{1}{2}$ ton of calcium oxide per acre to the subsurface layer being greater than that from the application of 1 ton to the surface layer. The greater part of the calcium loss was found in the leachings of the first year. The increased losses of calcium from lime treatments incorporated into the lower layers were found to be due to bicarbonates derived from the fixed lime, whereas the losses from surface incorporations were considered to be mainly accounted for by the leachings of biological end products. The relation of rate of liming to calcium conservation is discussed.

Magnesium losses were rather uniform, with evidence of repressed solubility in the lime-treated layer. The greater part of the nitrate loss was found to occur during the first year, nitrates accumulated during the summer months being removed by early winter rains. There appeared to be no further formation of nitrates until after the May collections of percolates. The high concentration of sulfate leachings during the winter months was attributed to the greater precipitation of sulfate sulfur during that season.

Studies on the transformations of iron in nature.—I, Theoretical considerations, H. O. HALVORSON and R. L. STARKEY (*Jour. Phys. Chem.*, 31 (1927), No. 4, pp. 626-631).—From a theoretical study of the transformations of iron in pure solutions, based on the quantitative relationships of the ionic activities involved, equations indicating the activity relationships among ferrous, ferric, and hydrogen ions and oxygen concentration are developed. The conclusion is stated that at pH values above 5.0 only very small concentrations of dissolved ferrous iron, and still smaller concentrations of dissolved ferric iron, "will occur in solution under atmospheric conditions."

Studies on the transformations of iron in nature.—II, Concerning the importance of microorganisms in the solution and precipitation of iron, R. L. STARKEY and H. O. HALVORSON (*Soil Sci.*, 24 (1927), No. 6, pp. 381-402, figs. 3).—Some microorganismic activities associated with the solution and precipitation and with the oxidation and reduction of iron compounds are discussed on the basis of the equations developed in the paper above noted, and experimental observations are stated, including the following:

Under aerobic conditions microorganisms may effect the solution of iron as a result of acid formation in dextrose solutions, while under anaerobic conditions in dextrose or peptone media, iron present as ferric hydrate may be dissolved and reduced as a result of the decreasing of oxygen pressure by the microorganisms, as well as by reason of the formation of acids, these effects being produced even at reactions close to neutrality. By reason of the extremely low ionization of iron in organic iron compounds, the metal may remain in solution in such combinations under conditions which would inhibit the solution of inorganic iron. Exposing solutions containing iron dissolved and reduced under anaerobic conditions to the air may cause reoxidation and precipitation, and these changes may occur independent of microbial activity. The precipitation of iron from its organic compounds results from the decomposition of the organic radicals with the release of ionic iron in more than saturation quantities, precipitation in this case being dependent upon the activity of the organisms capable of decomposing the organic radicals and not upon the direct action of the microorganisms upon the iron. Oxidation of iron compounds was found not to result necessarily in the precipitation of ferric iron, and the precipitation of ferric iron does not necessarily indicate an immediately preceding oxidation.

Report on inspection of commercial fertilizers for 1927, E. M. BAILEY (*Connecticut State Sta. Bul.* 290 (1927), pp. 88+X).—This contains the usual analyses and other data and information for the guidance of the purchaser.

AGRICULTURAL BOTANY

Water requirements of plants during the vegetative period [trans. title], W. WUNDERLICH (*Bot. Arch.*, 15 (1926), No. 3-4, pp. 262-278).—Data are presented for *Secale cereale*, *Poa pratensis*, *Arrhenatherum elatius*, *Lolium perenne*, *Festuca pratensis*, *Phleum pratense*, *Cannabis sativa*, *Phaseolus nanus*, *Spergula arvensis*, *Avena sativa*, *Pisum sativum*, *Zea mays*, *Lupinus angustifolius*, *Trifolium repens*, *T. pratense*, *Melilotus alba altissima*, *Lotus uliginosus*, *Ornithopus sativus*, and *Sinapis alba*. The consumption of water by the plant per gram of dry substance increases with the amount of water at disposal.

The use of water depends principally upon the developmental stage of the plant, climatic influences being secondary. Evaporation under full shade is practically negligible.

Water requirement of the principal cultivated plants [trans. title], W. PILASKI (*Bot. Arch.*, 15 (1926), No. 5-6, pp. 325-376, figs. 6).—Figures are tabulated for a considerable number of economic plants.

The influence of soil-water content on plant production [trans. title], F. WIENENBERG (*Bot. Arch.*, 14 (1926), No. 3-4, pp. 261-283).—This is a descriptive and mathematical consideration of soil-water content as a factor in plant production according to the conception of growth factors as held by Mitscherlich (*E. S. R.*, 48, p. 518; 50, p. 532; 55, p. 519).

The influence of soil reaction on the H-ion concentration of leguminous saps [trans. title], M. GÓRSKI and O. DĄBROWSKA (*Rocz. Nauk Rolnicz. i Leśnych*, 14 (1925), No. 3, pp. 445-462, figs. 6).—Studies were made in regard to the effects of altering soil reactions by the addition of sodium hydroxide or of sulfuric acid to soil in pots on the H-ion concentration of root, stem, and leaf saps in *Lupinus albus*, *L. luteus*, *L. angustifolius*, *Ornithopus sativus*, *Vicia faba*, and *Pisum arvense*. A relation was shown, details regarding which are given.

Plant influence on the H-ion concentration of soils [trans. title], M. GÓRSKI and O. DĄBROWSKA (*Rocz. Nauk Rolnicz. i Leśnych*, 14 (1925), No. 3, pp. 463-470).—All the plants studied, including *Lupinus luteus*, *L. albus*, *L. angustifolius*, *Pisum arvense*, *Vicia sativa*, *V. faba minor*, and *Ornithopus sativus*, influenced the H-ion concentration of the soils in which they were grown.

Studies on the morphological and physiological characters of nearly related strains [trans. title], C. KRULL (*Bot. Arch.*, 15 (1926), No. 3-4, pp. 189-246).—The methods in use hitherto not being regarded as sufficiently exact to establish the finer distinctions necessary to discriminate between nearly related pure line forms, the author has attempted to improve on those methods in ways which are detailed. A bibliography of 108 titles is included.

The capability of plants to neutralize in greater or lesser degree acidity or alkalinity in their growth media—that is, their individually typical reaction energy—constitutes a standard for their reaction sensitivity.

Utilization of atmospheric nitrogen by green plants [trans. title], G. TRUFFAUT and N. BEZSSONOFF (*Rev. Gén. Sci.*, 38 (1927), No. 13, pp. 389-394, figs. 2).—Work described or mentioned, but not cited, is claimed to support the view that the utilization of atmospheric nitrogen in some degree is general among green plants, though further experimentation is needed.

Studies on nitrate utilization by plants.—I, **The régime of nitrate nitrogen under natural conditions of plant development** [trans. title], A. SHMUK [SHCHMUCK] (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.)*, 3 (1925), pp. 77-94, fig. 1).—Summarizing the results of a series of experiments, the author comes to the following conclusions:

(1) Soils entirely covered with vegetation contain either no free nitrates or very minute amounts. (2) Even large amounts of nitrates in the soil disappear as the vegetation develops. This can not be fully accounted for by the direct utilization of nitrates, by leaching out, or by cessation of the nitrification process. (3) The disappearance or absence of nitrates is a result of the specific action of the root mass. (4) There is a substance in the plant roots (coferment) which stimulates the activities of denitrifying organisms as well as the denitrifying ferments of the plants. (5) The reduction of nitrates by plant roots in solution goes on with great energy, and the products formed are nitrites and ammonia. After prolonged reduction the nitrates disappear entirely, and ammonia appears to be the more stable product of the process. (6) Under natural conditions of nitrogen nutrition the nitrates can not serve as the chief source of supply and they are always in a condition of well-defined minimum. It is more probable that ammonia is the source of nitrogen nutrition. The nitrates are brought to the state of ammonia by the specific action of the roots. (7) In the plant roots there is a fermenting apparatus (ferment

and coferment) which is more efficient in the reduction of nitrates than any apparatus in any other part of the plant. (8) The amount of nitrates is less in the plant roots than elsewhere in the plant.

Studies on nitrate utilization by plants.—II, Reduction of nitrates by the root substratum of the plant [trans. title], A. SHMUK [SCHMUCK] and V. BALABUKHA (BALABUCHA) (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.)*, 4 (1926), pp. 21-40, figs. 6; *Ger. abs.*, pp. 39, 40).—The root substance of plants brings about a decided reduction of nitrates and furnishes specific and optimal nutritive media for organisms of two types indicated, both of which are characteristically insensitive to sodium fluoride. The amount of decomposed nitrate equals that of the newly formed nitrite. No formation of ammonia at the expense of the decomposed nitrate is observable. Other phases are detailed.

Carbon dioxide assimilation [trans. title], J. BOEDLER (*Bot. Arch.*, 20 (1927), No. 3, pp. 143-178, figs. 14; *Eng. abs.*, p. 178).—The main portion of this work presents a collective report, claimed to show for the first time the newer assimilation theories combined.

The influence of external factors on starch formation in foliage [trans. title], L. SCHMETZ (*Bot. Arch.*, 10 (1925), No. 1-2, pp. 16-33).—In brief systematic detail, with a bibliography of 23 titles, the author outlines the influence on starch formation of oxygen starvation, water content, light, solutes, and narcotics. Comparison is made regarding the relations of stomatal aperture and of assimilative energy to various external factors.

Respiration activity and peroxidase content in leaves of *Acer negundo* [trans. title], A. I. SMIRNOV (SMIRNOW) (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.)*, 4 (1926), pp. 1-9; *Ger. abs.*, p. 8).—It was found that in *A. negundo* the respiration intensity of green leaf parts is nearly twice as great as that of etiolated portions. The carbon dioxide liberated from green or white leaf parts is in direct proportion to the soluble carbohydrate (monosaccharide) and peroxidase which these parts contain. As regards the partitioning of dry substance, of soluble carbohydrate (monosaccharide), and of peroxidase between green and white leaf parts, a direct connection is found to exist. Peroxidase (activity) per unit of dry weight of green parts is nearly the same in amount as that of white leaf parts. In the green state, the green parts show the more peroxidase activity, and from this fact albinism is thought to be related rather to peroxidase than to oxidation. Respiration intensity depends not alone upon peroxidase content (activity), but in greater degree upon soluble carbohydrates, the presence of which favors not alone respiration intensity but also peroxidase formation.

The influence of hydrogen peroxide on peroxidase activity of water extract from plant material [trans. title], A. I. SMIRNOV (SMIRNOW) (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.)*, 4 (1926), pp. 11-20, figs. 3; *Ger. abs.*, p. 19).—The author finds that 5 cc. of a 1 per cent solution of hydrogen peroxide is detrimental when used all at once on 50 cc. of reaction material for the determination of peroxidase, particularly when the reaction material itself contains even small portions of peroxidase. The detrimental influence of hydrogen peroxide on peroxidase depends not upon the absolute amount of peroxide but upon its concentration. The effects of time and concentration are detailed.

Studies on seed and plant stimulation [trans. title], BRINGMANN, GISEVIUS, and STRAIB (*Pflanzenbau [Berlin]*, 1 (1924), No. 12, pp. 193-196; 1 (1925), No. 13, pp. 210-216).—Plant-growth promotion in the earlier developmental stages was obtained with several inorganic compounds, which are indicated.

The applicability of this plan or principle at other stages and in agricultural practice is yet to be ascertained.

The significance of seed stimulation [trans. title], M. POPOFF (*Pflanzenbau [Berlin]*, 1 (1925), Nos. 13, pp. 221-223; 14 pp. 236-239).—The data regarding growth promotion, which are tabulated with brief discussion as obtained from seed stimulation tests, are partly or wholly positive for oats, barley, potato, sugar beet, and buckwheat, with varying results for several other economic plants. The principle and plan are thought to be of wide application.

Seed potato stimulation [trans. title], W. GLEISBERG (*Pflanzenbau [Berlin]*, 1 (1924), No. 2, pp. 29-31).—Particulars and tabulations are given of stimulation experiments with seed potatoes (*E. S. R.*, 57, p. 119), which were subjected to magnesium chloride and sulfate, Germisan, Segetan, Uspulun, Tillantin B, and Tillantin O.

Seed potato stimulation [trans. title], K. MAIWALD (*Pflanzenbau [Berlin]*, 1 (1925), No. 20, pp. 343-345).—A comparative account is given of this work, which appears to have been undertaken in view of the findings reported by Gleisberg, above noted.

Study of stimulation in potato [trans. title], DUBIEL (*Pflanzenbau [Berlin]*, 1 (1925), No. 18, pp. 306-308).—Yield increase, in correlation with the application of stimulation to seed potatoes by the use of inorganic salts in solutions of different strengths, though not high was always obtained. Starch content was also favorably influenced.

A field experiment testing seed stimulation in rice [trans. title], ST. KONSULOFF (*Pflanzenbau [Berlin]*, 1 (1925), No. 19, pp. 324, 325).—An account is given of successful stimulation tests by the author with rice.

Tobacco stimulation [trans. title], M. POPOFF (*Pflanzenbau [Berlin]*, 1 (1925), No. 19, pp. 325, 326).—Tobacco seed stimulation resulted in the production of plantlets fit to set out earlier, better utilization of early spring moisture, and a heavier crop.

[Stimulation and inheritance], W. GLEISBERG (*Pflanzenbau [Berlin]*, 1 (1925), No. 16, pp. 270-272).—Among the modifications of plants that may be produced in various ways indicated is that due to so-called stimulation, by employing various chemical and other agencies. It is thought likely that only when stimulation treatments have been followed for more than two generations can it be known whether, or how far, stimulation is hereditarily effective in modification.

Yield increase through stimulation [trans. title], E. MÜNCH (*Pflanzenbau [Berlin]*, 3 (1926), No. 1, pp. 1-6).—Stimulation, here defined as influencing seed by means of excitants with a view to increasing the yield, and claimed to have been used to considerable advantage by several persons named, has been tested by the present author on rye, barley, and wheat, with results which, as tabulated, are considered to indicate the necessity for further study.

Conduction and reaction in traumatic stimulation of plants [trans. title], E. BUENNING (*Bot. Arch.*, 15 (1926), No. 1-2, pp. 4-60, figs. 42).—A study is presented of stimulation, conduction, and reaction in *Allium ascalonicum* as regards coagulation of cytoplasm or nucleus, diminution of isotonic coefficients, increase of permeability, and other changes in physical properties of the protoplasm, the facts and conclusions from which are given in considerable detail.

The coagulation of protoplasm [trans. title], E. BUENNING (*Bot. Arch.*, 14 (1926), No. 1-2, pp. 138-164, figs. 28).—This work is detailed as carried out with wound stimulation in seedlings of *Secale cereale* and *Raphanus sativus* and

with shoots of *Tradescantia viridis*. Comparisons are made with results reported by others.

The influence of the ray energy of the radioactive elements and X-rays on the growth and development of plants [trans. title], A. V. and L. I. Kol'tsov (*Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Leningrade)*, 3 (1926), pp. 254-269).—In a former publication² the results of experimentation were reported as to the influence of (1) a radium preparation on dry wheat seeds, (2) radium preparations and mesothorium on wheat and pea seedlings, (3) radium on the growing plants and the sexual organs of the plant, and (4) X-rays on dry pea seeds, wheat seeds, and seedlings. In continuation of that study the authors have dealt with the influence of radium exposure on the sexual organs of the flowers (continued for periods of 1.5 to 2.5 hours either on the stamens or pistils) or on the entire plant. It appears that the influence on the seeds is more pronounced when the sexual organs are exposed to the radium. No destructive changes were apparent in the morphological structure of the plants due to the effects of the radium.

Progenies from X-rayed sex cells of tobacco, T. H. GOODSPEED and A. R. OLSON (*Science*, 67 (1928), No. 1724, p. 46).—In January, 1927, the authors subjected plants of *Nicotiana tabacum purpurea* in full flower to moderately hard X-rays, after which all open flowers were removed and the remaining buds trimmed to a series of size classes. Within 48 hours all buds except those in which pollen had formed had fallen. Seed from 7 capsules was produced by selfing the flowers from the larger buds, and they gave about 1,000 plants which began to flower in July.

At the seedling stages the presence of variant plants was apparent, and at maturity more than 20 per cent of the total were striking variants. In one lot of 200 plants there were more than 70 per cent of variant individuals. With some marked exceptions, fertility in general was found to parallel the extent of total variation. The more abnormal the plants, the more sterile they were.

Progenies from the different populations and from subsequent X-raying of different species of *Nicotiana* are being grown, special attention being given to the effects of irradiation on mature pollen.

Etiolation in ferns and the causation of etiolation in general [trans. title], M. HOMMER (*Bot. Arch.*, 14 (1926), No. 1-2, pp. 1-46, figs. 32).—The studies here reported are considered in general to favor the view that light, as a formative stimulus, is the decisive factor in the phenomena of etiolation.

Experimental study of the struggle for existence among plants [trans. title], L. I. USPENSKAYA (*Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Leningrade)*, 3 (1926), pp. 115-159, fig. 1).—The author studied the individual course of plant growth under various competitive conditions in thin and in thick plantings (plots 1 by 1.5 meters) of hemp, flax, buckwheat, and sunflower. Observations and measurements of the height of the plants were made at certain intervals, and the data obtained were worked over by statistical methods. It is concluded that on the average in the thickly seeded plantings height increases more in the first half of the vegetative period; later there is a slowing down of growth in height. In the thinly seeded plots the plants are found to be higher at the end of the vegetative period than are those in the thickly seeded plots. The intensity of the struggle for existence increases the differentiation of the stems only to a certain limit in hemp and buckwheat and decreases the differentiation in flax, while in case of sunflower, differentiation due to the influence of the thickness of seeding was noticed throughout the observations.

² *Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Leningrade)*, 2 (1925), pp. 205-222.

Primary differences in plant heights due to heredity or environment tend to disappear, although they may remain distinct until the end of the vegetative period.

Studies on experimental phytosociology [trans. title], V. SOCHAVA (*Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Leningrade)*, 3 (1926), pp. 160-215, figs. 9).—Flax, mustard, buckwheat, and sweet clover were planted on manured and on unmanured plats (1.5 by 1 meter) with five gradations as to thickness of seeding, in order to study the struggle for existence as proceeding under poor and under favorable growth conditions. At frequent intervals observations were made or measurements taken as to the height of the plants, number of branches, leaves, and flowers, and diameter of stems, and finally as to the total dry weight of above-ground portions, from 50 to 100 plants being used for each observation. The figures obtained were worked over by statistical methods. For each variable series there were determined the average value (M), the departure (σ), and the coefficient of variability (C). For each element of the variable series its error was calculated (M , M_σ , M_c); for

M the average error was calculated by the formula $M = \frac{\sigma}{\sqrt{n}}$; for C by the formula $M_c = \frac{C}{-\sqrt{2n}}$. Whenever it appeared significant, a correlation coefficient was determined. The results are presented in tables and graphs, with a discussion for each plant.

[Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, during the period from April 1 to September 30, 1925] (*U. S. Dept. Agr., Inventories* 83 (1927), pp. 54; 84 (1927), pp. 36).—Descriptive and economic notes are given of more than 1,500 lots of seeds and plants introduced from various sources for testing and plant breeding experiments in the United States during the period indicated.

GENETICS

Darwin's theory of man's descent as it stands to-day, A. KEITH (*Science*, 66 (1927), No. 1705, pp. 201-208).—The author points out how evidence has been discovered to fill in many of the gaps in the theory of the descent of man as developed by Darwin.

A recent modification of the species-idea, A. B. BROOGLEEVER FORTUYN (*Nature [London]*, 120 (1927), No. 3034, pp. 933, 934).—A discussion of a concept of a species, in which it is pointed out that a species refers to a phenotype and not to a genotype, thus allowing for variation and the isolation of different pure lines within a species.

The gene and the ontogenetic process, F. R. LILLIE (*Science*, 66 (1927), No. 1712, pp. 361-368).—A discussion of the relations between genetics and the physiology of development which have resulted from the recent advances in these two subjects.

The location of eighteen genes in *Lebistes reticulatus*, Ö. WINGE (*Jour. Genetics*, 18 (1927), No. 1, pp. 1-43, pls. 3).—The author briefly describes eighteen genes for color and spotting which have been found in *Lebistes*. As nine are new genes not previously described, their more important effects are noted.

Nine of the genes, viz, *L. maculatus*, *iridescent*, *oculatus*, *ferrugineus*, *sanguineus*, *aureus*, *armatus*, *pauper*, and *variabilis*, have been located in the Y chromosome; three genes, viz, *L. coccineus*, *lineatus*, and *tigrinus*, in the X chromosome; while five others, viz, *L. luteus*, *elongatus*, *minutus*, *vitellinus*, and *cinnamomeus*, have been found in both X and Y chromosomes, and crossing

over between them has been observed. Only one gene, *L. zebrinus*, has been located in an autosome.

Selection experiments dealing with the action of some of the genes indicated that minor modifying factors were also operating.

Chromosome number in species of *Hordeum*. F. GRIFFEE (*Minn. Univ., Studies Biol. Sci.*, No. 6 (1927), pp. 319-331, pls. 2).—Cytological studies of barley species at the Minnesota Experiment Station resulted in the following grouping, based on somatic chromosome number: (1) *Vulgare* 14—*H. vulgare*, *H. distichon*, *H. intermedium*, *H. defolens*, *H. spontaneum*, *H. maritimum*, and *H. caput medusae*; (2) *jubatum* 28—*H. jubatum* and *H. murinum*; and (3) *nodosum* 42—*H. nodosum*. Available information suggests that group (1) is more closely related to group (2) than to group (3). A comparison of the three groups of *Hordeum* on the basis of chromosome number in relation to number of varieties, disease resistance, and pollen grain size shows a lack of positive correlation between chromosome number and economic value. All cultivated varieties of barley belong to the *vulgare* group. Measurements of 100 pollen grains in each species showed pollen grains of *H. distichon* to average 48.4 μ , *H. jubatum* 41.4, and *H. nodosum* 50.7 μ .

Inheritance in domestic animals: A guide for the animal breeder, C. WRIEDT (*Vererbungslehre der Landwirtschaftlichen Nutztiere. Ein Leitfaden für Tierzüchter*. Berlin: Paul Parey, 1927, pp. [4]+110, figs. 53).—A brief account of the principles of heredity, with a description of the inheritance of characters of economic importance in domestic animals.

The inheritance of horns in cattle.—Some further data, A. D. B. SMITH (*Jour. Genetics*, 18 (1927), No. 3, pp. 365-374, pl. 1, figs. 4).—The author reports a lack of complete dominance of the polled character to horns in cattle from two sources. Matings of Aberdeen-Angus bulls to native horned cattle of Northern Rhodesia, known as Angoni and Mashukulumbwe cows, produced polled heifers and polled and horned bulls. The numbers in one such cross were 27 polled heifers, 9 polled bulls, and 15 bulls with distinct horns or buds. Other cases of matings of polled and horned individuals producing horned offspring in unusual frequency are cited from the Wild White Park Cattle of England. Though there were no reliable cases of horned \times horned matings producing polled animals, it is concluded that certain factors carried by these breeds modify the normal mode of inheritance of horns.

Evidence is cited to indicate that in evolution cattle were first polled, later horns were sex-limited to males, and finally both sexes acquired horns.

Polled and horned cattle. R. C. M. AULD (*Jour. Heredity*, 18 (1927), No. 7, pp. 309-321, figs. 10).—Historical evidence is presented to indicate that the first bovine and other ruminant animals were originally hornless, while horned cattle were a later development.

The inheritance of black, yellow, and tortoiseshell coat-colour in cats. R. C. BAMBER (BISBEE) and E. C. HERDMAN (*Jour. Genetics*, 18 (1927), No. 1, pp. 87-97).—In studies, at the University of Liverpool, of the inheritance of black, yellow, and tortoise shell in cats, the following results were obtained in 22 matings: Black $\delta \times$ black \varnothing produced 5 black $\delta \delta$ and 8 black $\varnothing \varnothing$; black $\delta \times$ yellow \varnothing produced 3 yellow $\delta \delta$ and 3 tortoise-shell $\varnothing \varnothing$; black $\delta \times$ tortoise-shell \varnothing produced 11 black $\delta \delta$, 8 yellow $\delta \delta$, 9 black $\varnothing \varnothing$, and 8 tortoise-shell $\varnothing \varnothing$; and yellow $\delta \times$ black \varnothing produced 7 black $\delta \delta$ and 2 tortoise-shell $\varnothing \varnothing$. In matings of yellow $\delta \times$ tortoise-shell \varnothing there were produced 1 black δ , 5 yellow $\delta \delta$, 4 yellow $\varnothing \varnothing$, 1 tortoise-shell \varnothing , and 1 yellow \varnothing having black spots on one foot. When the anomalous yellow \varnothing was mated

to a yellow ♂ there were produced 3 yellow ♂♂, 2 yellow ♀♀, and 1 anomalous yellow ♂ similar to its dam.

Various hypotheses are discussed for the inheritance of these colors, from which it is concluded that either black and yellow are sex-linked or one is sex-linked and completely dominant to the other in the male and incompletely dominant in the female. It was also found in connection with the study that all yellow cats of both sexes have a few black hairs, pointing toward a lack of sex-difference in dominance.

The appearance of the anomalous yellow female and her similar male offspring was considered to point toward the fractionation of a factor.

Genetic studies in poultry.—II, The inheritance of skin color, W. V. LAMBERT and C. W. KNOX (*Poultry Sci.*, 7 (1927), No. 1, pp. 24-30).—Studies of the inheritance of skin color in the F_1 , F_2 , and back-cross progeny from reciprocal matings between Black Langshans and White Plymouth Rocks and between Buff Orpingtons and White Plymouth Rocks, at the Iowa Experiment Station, indicated that white skin color acted as a simple dominant to yellow, with segregation closely approximating a 3:1 ratio in the F_2 generation. The factors for white and yellow skin color were inherited independently of the factors for colored and white plumage, C and c.

Hybrid vigor in poultry, D. C. WARREN (*Poultry Sci.*, 7 (1927), No. 1, pp. 1-8, fig. 1).—Comparisons of the vigor of the F_1 hybrids produced by crossing Jersey Black Giants and Single Comb White Leghorns with the two pure breeds, in studies at the Kansas Experiment Station, showed that the hybrids surpassed both pure breeds in egg production, hatchability of the eggs, percentage of chicks surviving to three weeks of age, and in rate of growth to twelve weeks. The hybrids were intermediate between the two breeds in weight at six months and in shank length, the former being more nearly that of the Jersey Black Giant, and the latter that of the White Leghorn breed.

Succeeding generations did not show the vigor exhibited by the F_1 hybrids

On the distribution of differences in vitality among individuals, R. PEARL (*Amer. Nat.*, 61 (1927), No. 673, pp. 113-131, figs. 4).—These studies, based on *Drosophila melanogaster* and cantaloupe seeds, have indicated that the distribution of individual differences in inherent vitality is of the same form as that of differences in total vitality as measured in different environments and when measured as the total duration of life or as the rate of growth.

Alcohol and eye defects in the albino rat (*Mus norvegicus albinus*), F. B. HANSON and F. HAYS (*Jour. Heredity*, 18 (1927), No. 8, pp. 345-350).—The occurrence of 3 individuals having eye defects is described among 3,500 rats produced in 15 generations, part of which were treated with alcohol (*E. S. R.*, 57, p. 28). As all of the eye defects were nonhereditary, and as one occurred in the treated and two in the control stock, the occurrence is not attributed to the treatment with alcohol fumes.

Some aspects of sexual difference in prenatal growth and death, O. RIDDLE (*Amer. Nat.*, 61 (1927), No. 673, pp. 97-112).—The author points out that the greater prenatal mortality of male as compared with female embryos is frequently attributed to the fact that male embryos are inherently weaker, but that this is probably not so much the case as the fact that mammalian embryonic development occurs in a female environment and that the dam produces hormones which filter through the placenta and which are antagonistic to the development of the male sex organs. Further, the vitamin B, protein, and metabolic requirements of males are greater than of female embryos. Thus males develop at a disadvantage.

Experiments on artificial cryptorchidism and ligature of the vas deferens in mammals, J. T. CUNNINGHAM (*Brit. Jour. Expt. Biol.*, 4 (1927), No. 4, pp. 333-341, figs. 2).—Records of the scrotal and abdominal temperatures of rabbits and man indicated that the scrotal temperature is lower than the abdominal temperature. This serves as the explanation of the degeneration in the seminal tubules and reduction in size of the testicles which follow displacement from the scrotum into the abdominal cavity.

Ligaturing the vas deferens but leaving the testicles in the scrotum caused some enlargement, though normal spermatogenesis was continued. Rejuvenation from vasectomy did not appear to be related to an increase in the interstitial cells.

The adaptation of spermatogenesis to temperature is attributed to the evolution of the scrotum, which was due to causes independent of the function of the testes.

The effects of hysterectomy on the system of sex organs and on the periodicity of the sexual cycle in the guinea pig, L. LOEB (*Amer. Jour. Physiol.*, 83 (1927), No. 1, pp. 202-224).—Studies of the effect of hysterectomy in the guinea pig on the sexual cycle showed that after complete or almost complete hysterectomy in mature females the essential changes characteristic of pregnancy were reproduced, largely through a considerable prolongation in the life and function of the corpus luteum. The persistence of this organ counteracts the effect of the follicular extract on the vagina and prevents ovulation, but not follicular development.

Partial hysterectomy leads to similar but quantitatively less marked changes, and incisions into the uterine cornua prolong the first succeeding sexual cycle. Differences in the effects of hysterectomy on the guinea pig and other animals, particularly the rat, are suggested as depending upon variations in the power of resistance to unfavorable conditions on the part of the corpus luteum or of the lutein cells in these species.

Hysterectomy in the immature guinea pig had little effect on the recurrence of the normal cycle.

Hormone control of cyclic growth and function of the female genital organs, E. ALLEN (*Amer. Nat.*, 61 (1927), No. 673, pp. 180-192).—A review.

Uterine grafts, J. HAMMOND (*Brit. Jour. Expt. Biol.*, 4 (1927), No. 4, pp. 349-356, pls. 2).—In studies of the possibility of increasing the length of time over which corpora lutea might be induced to persist in pseudo-pregnant rabbits, tissues from fetuses were inserted by operative procedure into such animals. Cartilage and epithelial grafts persisted and grew when they were attached to the muscular layer of the uterus, but their growth did not influence the persistence of the corpora lutea or the development of the mammary gland. Grafts lying in contact with the mucosa were absorbed rather than nourished, and living fetal tissue failed to cause further development of deciduomata induced by incisions in the mucosa.

It is suggested that the attachment of the fetus is normally attained by the continuous erosion resulting from the digestive ability of the trophoblast, a function not possessed by the fetal tissue.

The effect of different amounts of sexual indulgence in the albino rat, I, II, J. R. SLONAKER (*Amer. Jour. Physiol.*, 82 (1927), No. 2, pp. 318-327, figs. 8; 376-380, figs. 2).—In part 1, Growth, a comparison is given of the maximum weights attained by male and female rats which were allowed to breed at different rates. It was found that virgin females were the lightest in weight, averaging 254 gm., followed in order by those which were hysterectomized and allowed to mate most frequently, averaging 266 gm. Females which mated sufficiently to produce two or three litters during their life averaged 298 gm.

Heavy breeders—young destroyed at birth and dams remated—averaged 304 gm., while medium breeders—allowed to mate and rear litters—averaged 306 gm.

Of the males, the animals with the lightest weights were those mating at will, followed by light breeders, medium breeders, and heavy breeders, while those confined without opportunity for mating attained the greatest weights. The rats allowed to mate grew more rapidly in early life than those restricted from mating, though bearing young at an early age inhibited growth in later life.

The voluntary activity, as determined in revolving cages, for the rats allowed different amounts of breeding in the above experiments was found in part 2, Spontaneous Activity, to be related inversely to the number of litters produced and to the rate of growth.

On the existence of egg-laying cycles in the domestic fowl, S. C. HARLAND (*Jour. Genetics*, 18 (1927), No. 1, pp. 55-62).—Preliminary studies of trap nest records of egg production in Trinidad Native, Leghorn, Minorca, and Plymouth Rock fowls in Trinidad indicated that the native breed showed cycles in its egg production, averaging about 12 eggs per clutch, but that such clutches were not observed in the American or European breeds. In 4 crosses the clutch habit appeared to be dominant to the lack of this habit.

FIELD CROPS

On the regression of soil properties and crop characters in associated plots of an experimental field, J. A. HARRIS, I. L. CONNORS, A. T. ELDERS, and L. E. KIRK (*Minn. Univ., Studies Biol. Sci.*, No. 6 (1927), pp. 351-371, figs. 8).—Data obtained in studies on soils and plant characteristics in plats of Acala, Pima, and Meade cotton at Sacaton, Ariz., gave indications that for a series of subplats located in the saline alluvial soils of southern Arizona the regression of the electrical resistance of the soils and of certain of the physicochemical properties of the leaf tissue fluids (depression of freezing point, specific electrical conductivity, ratio of conductivity to depression, and chloride content) of the cotton grown upon these subplats may for all practical purposes be considered linear.

On the elimination of symmetry as a source of spurious values of the field heterogeneity coefficient, J. A. HARRIS (*Minn. Univ., Studies Biol. Sci.*, No. 6 (1927), pp. 343-350).—Formulas by which symmetry of the correlation surface as a possible source of error in the calculation of the field heterogeneity coefficient (η) may be eliminated are presented in this contribution from the University of Minnesota.

The influence of geographical factors on the composition of crop plants [trans. title], N. N. IVANOV (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 23-32).—Varieties of wheat, rye, oats, and barley were grown in several localities differing in latitude and longitude, and the grain was subjected to biochemical analysis. The protein content of wheat appeared to increase as the plantings were made farther to the south and also from west to east. At a northern latitude with natural rainfall the protein content was higher than at 5° farther south under irrigation. An increase in the starch content occurred as the protein content decreased. Barley, oats, and rye showed similar responses to changes in latitude and longitude. The size and weight of the grain appeared to show that the increases in protein content were due to location and not to maturity.

The oil content of flaxseed did not seem to vary with the climate, suggesting that it is heritable. The iodine number, however, increased toward the north.

[Field crops work in South Carolina] (*South Carolina Sta. Rpt. 1927*, pp. 14-16, 31, 32, 84-87, 88, 91, 92).—Continued investigations (E. S. R., 56, p. 525) reported on from the station and substations comprised varietal trials with corn and small grains (E. S. R., 58, p. 325), including oats, rye, wheat, and barley, trials of winter and summer legumes, fertilizer tests with potatoes, tobacco, corn, and sweet potatoes, miscellaneous trials with peanuts, and pasture studies.

East African pasture plants.—II, East African grasses, C. E. HUBBARD, W. E. TREVITHICK, and J. HUTCHINSON (*London: Crown Agents for Colonies, 1927*, pp. 56, figs. 50).—Part 2 of this work (E. S. R., 56, p. 334) describes and indicates the uses and distribution of 30 of the common pasture grasses which occur generally throughout Kenya Colony, Uganda, and Tanganyika Territory.

Rational cereal culture, G. PAMMER and R. RANNINGER (*Der Rationelle Getreidebau. Vienna: Julius Springer, 1928*, pp. VIII+204, figs. 39).—This manual deals with the botanical characteristics of grain crops, their climatic, soil, and cultural requirements, harvesting, improvement, seed quality and certification, and insect pests and diseases, being intended for conditions in Austria. A special section describes important varieties and the particular requirements of rye, wheat, barley, oats, corn, millet, and buckwheat.

Studies in crop variation.—IV, The experimental determination of the value of top dressings with cereals, T. EREN and R. A. FISHER (*Jour. Agr. Sci. [England]*, 17 (1927), No. 4, pp. 548-562, fig. 1).—The fourth number of this series (E. S. R., 52, p. 526) deals with the problem of the optimum time of application of nitrogenous top-dressing to grain for maximum yields. The experiment provided for early and late applications of 1 and 2 cwt. per acre of ammonium sulfate and equivalent rates of ammonium chloride applied to oats on $\frac{1}{2}$ -acre plats, arranged together with 4 plats not top-dressed into 8 randomized blocks of 12 plats each. The relative merits of this method of experimentation and of the several treatments receive detailed discussion.

The barleys of Azerbaijan (eastern Transcaucasia) [trans. title], L. L. DEKAPRELEVICH (*Izv. Tiflissk. Gosud. Politekh. Inst. (Bul. Polytech. Inst. Tiflis)*, 2 (1926), pp. 293-300; *Eng. abs.*, p. 300).—Studies by the Tiflis Botanical Garden showed that in the zone up to 3,500-4,000 ft. above sea level botanical forms of barley are comparatively few, winter forms being grown almost exclusively. A yellow spike variety of *Hordeum vulgare pallidum* predominated in the fields and attained the altitude of 4,000 ft. *H. vulgare nigrum* and *H. vulgare nigropallidum* were of much less frequent occurrence. *H. distichon nutans* was found only between 3,500 and 9,000 ft. A wild barley, *H. distichon spontaneum*, was found as a weed in the barley fields of the Baku district. The barleys of this region are characterized by a low protein content.

Corn and Italian rural life, L. MESSEDAGLIA (*Il Mais e la Vita Rurale Italiana. Piacenza: Fed. Ital. Consorzi Agrari, 1927*, pp. 446, [pls. 26]).—Largely drawn from historical sources, this book gives an extended account of the early history of corn in America and elsewhere, its introduction into Europe and circumstances involved in its dissemination, culture, and use, nomenclature, botanical relationships, and its relation to pellagra. The historical and present status of the crop in the several subdivisions of Italy is treated in some detail. Copious bibliographical notes supplement each chapter.

[Cotton investigations in South Carolina] (*South Carolina Sta. Rpt. 1927*, pp. 9-14, 16, 17-20, 22-25, 48-50, figs. 5).—Continued experiments with cotton (E. S. R., 56, p. 528) are reported on.

The number of plants per acre appeared to be highly important from the viewpoints of earliness and total production under boll weevil conditions.

Cotton plants have fruited about as rapidly during the early weeks of the fruiting period when crowded as when spaced farther apart. Spacing tests with Carolina Foster, Dixie Triumph, and Delta No. 5 showed that these varieties yielded best with plants from 6 to 12 in. apart in the row. In the hill tests the results resembled those during previous years, 2 stalks giving the largest yield in 12 and 18 in. spacing and 3 stalks in hills 24 in. apart. The highest yield of seed cotton came from plantings made about April 15. Dixie Triumph and a Cleveland strain led the short staple varieties, and Carolina Foster No. 3 and Delta No. 5 the long staples at the Pee Dee Substation, and three commercial strains of Cleveland were first at the Coast Substation. The time of picking seemed to influence quality and yield to a certain extent, cotton picked four times yielding 1,613 lbs., while alternate rows left until all the cotton was open made 1,449 lbs.

Delinting seed with sulfuric acid has been profitable where farms are equipped for this treatment. Acid delinted seed has outyielded machine delinted seed and untreated seed in the order given, while seed rolled in sodium nitrate or ashes made less than untreated seed.

Fertilizer tests showed that the outstanding need of all soils of South Carolina is for an increased supply of nitrogen for all crops ordinarily fertilized, and that phosphorus and potassium also should be supplied if highest yields are to be expected. The merits of different sources of nitrogen have been discussed elsewhere (E. S. R., 55, p. 420). In general, the mineral or inorganic sources appeared to pay best for the investment, especially for crops such as corn and the small grains which have a critical period of growth. Since the growing season of cotton has been considerably shortened because of the boll weevil, cotton also profits most by applications of quickly available forms of nitrogen. Cotton yields at the Pee Dee Substation illustrated the mutual dependence of rotation and proper fertilization.

Studies of the effects of fertilizers on the fruiting of cotton (E. S. R., 57, p. 129) have shown the value of phosphorus in producing early fruit. The boll period, or time from flowering to open boll, was not materially influenced by increasing the quantity of phosphorus in the fertilizer. The earlier maturity of the crop due to phosphorus applications seemed caused by stimulation of early fruiting rather than a hastening of boll development. Distinct and definite varietal differences in the beginning and rapidity of fruiting and in shedding and time required for square and boll development have been observed, as well as a distinct and possibly inherited plant variation. Correlation studies showed no relation to exist between square and boll periods.

Physiological studies demonstrated that the square period is practically constant throughout the blooming season and is not prolonged as is the boll period. The square period of forms which shed after blooming is little, if any, longer than that of forms which mature. A square with a short maturation period seems no more apt to produce a boll with a short period than with a long one. It seemed probable that the percentage of squares blooming or which set bolls is influenced quite largely by insect activity, especially the cotton flea hopper, rather than by any physiological peculiarity of the cotton plant. Variation was observed between cotton varieties in their ability to germinate at low temperatures and also between individual seeds within a variety. Evidence thus far obtained indicated that plants allowed to develop their full complement of buds and those with the buds removed have similar vegetative behavior until the former have a crop of fair size bolls. The normal plants then elongate very slowly or stop altogether, while the debudded plants continue elongation.

Soil temperatures under cotton in Egypt, E. MCK. TAYLOR (*Jour. Agr. Sci. [England]*, 17 (1927), No. 4, pp. 489-501, figs. 5).—Observations made at Giza indicated that in Egypt during germination and increase in height of the cotton plant the soil temperatures are rising and the amplitude of the temperature wave is at its maximum. The maximum soil temperatures appeared to decline while the minimum soil temperatures remain constant, thus resulting in a gradual decrease in the amplitude of the daily temperature wave during the branching and blooming periods. Throughout the soil zone occupied by the plant roots the temperature is the same, the amplitude of the daily temperature wave is small, and the temperature is constant during the boll development and maturation periods. The main effect of irrigation on soil temperatures is to reduce the amplitude of the daily temperature wave. Considering the range of air temperature in other cotton-producing regions, it seems probable that the characteristics of the soil temperatures during the boll development and maturation periods are similar for all countries.

The British Cotton Growing Association: [Twenty-first and twenty-second annual reports, 1925 and 1926] (Brit. Cotton Growing Assoc. [Pubs.] 91 (1926), pp. 55, pls. 12; 97 (1927), pp. 62, pls. 9).—Similar in scope to a previous note (E. S. R., 54, p. 234), these reports describe the activities of the association during 1925 and 1926 and give summary accounts of cotton production in the British colonies and possessions.

Annual report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1927 (Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1927, pp. [2]+116, pls. 14).—The marketing, technological research, and administrative activities of the organization (E. S. R., 57, p. 828) in different localities in India are reported on for 1927.

A new variety of cotton from China, J. B. GRIFFING (*Jour. Heredity*, 18 (1927), No. 11, pp. 496, 497, figs. 2).—Million Dollar, an Asiatic cotton selected by the University of Nanking, has unusually large bolls, over 60 per cent of which are 4-locked on favorable soil and a few 5-locked, a lint stapling from 1 to $1\frac{1}{2}$ in., a lint percentage of from 81 to 83, and a lint index ranging from 4 to 4.5. The lint was spun into counts up to and including 42's, giving a yarn of unusual whiteness. Breaking tests showed its yarn to surpass considerably that from common Chinese cotton.

The establishment of standard grades for American cotton linters, G. S. MELOY (*U. S. Dept. Agr., Misc. Pub. 10* (1927), pp. 8).—Cotton linters is defined, grades are described, and industrial trading rules are outlined, with a review of the movement leading to the establishment of standard grades for linters under the authority of the cotton standards act. Cooperative studies led to the conclusion that linters is a commixture of two types of fibers, the long, usually soft or flaccid fibers that may have escaped removal during ginning, and the very short, more deeply colored fibers or fuzz that are found more or less densely matted about the seed coat at the base of the long fibers of American upland varieties of cotton, and that there are four factors influencing the grade or value of linters—staple, foreign matter, color, and character.

The potato: Its history, varieties, culture, and diseases, T. P. McINTOSH (*Edinburgh: Oliver and Boyd, 1927, pp. XVI+264, pls. 11, figs. 16*).—Intended for general use in the British Isles, this book discusses potatoes under the topics of history, botany, reproduction and propagation, cultivation and utilization, and diseases, pests, and injury. Considerable space is devoted to varietal characteristics, classification, and improvement work.

Classification of potato varieties, H. L. DE VILMORIN (*Catalogue Méthodique et Synonymique des Variétés de Pommes de Terre*. Paris: Vilmorin-Andrieux & Co., 1927, 4. ed., rev., pp. IX+[3]+62).—Potato varieties grown during the last 25 years at Verrières-le-Buisson, France, are grouped according to tuber color and shape, and color of sprout, flesh, and flowers, are listed alphabetically, and synonyms are indicated.

Viability and composition of "seed" potatoes as affected by climatic conditions and by various other factors, P. H. WESSELS and B. L. HARTWELL (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 9, pp. 761-780).—Potato experiments at the Rhode Island Experiment Station dealt with the factors affecting yields and the nitrogen content resulting from the influence of these factors.

Northern-grown (northern New England) seed potatoes usually, although not invariably, produced more in Rhode Island than did home-grown seed. Decreases in yields from home-grown seed were progressive in spite of tuber unit selection. As a general average for three varieties, northern-grown potatoes averaged 221 bu. per acre, and potatoes grown in Rhode Island 1 year 186 bu., 2 years 168, and 3 years 121 bu. Although northern-grown seed was evidently much superior to immature local seed, this was not due in large degree to storage conditions. Increased number of sprouts seemed due to larger seed pieces, while with seed pieces of the same size number of stalks depended on the variety of potato used. Large pieces planted in alternate hills in the row with small pieces gave nearly twice the yield of the small, while in adjacent rows their increases were only 25 to 30 per cent more. The increased yield from large pieces seemed due to the thicker stand produced. The number of stalks per hill rose with the number of eyes per seed piece. Potatoes small at the end of the season were small, evidently because of slower growth rate and not because of a more recent origin than larger sizes. The use of the straw mulch tended to reduce yields, although potatoes grown under a mulch were somewhat superior for seed.

Fresh potatoes dug on July 26, August 21, and September 26, respectively, on the basis of dry matter increased in total and decreased in soluble carbohydrates. They also increased in the proportion of nonprotein to total soluble nitrogen. The general effect of storage until the next spring was to decrease the total and increase the soluble carbohydrates and to decrease the soluble nitrogen. Attention is called to the tendency toward increased viability accompanying a scarcity of potassium and to the larger percentage of nitrogen and greater proportion of nonprotein nitrogen in such seed. The larger percentage of nitrogen and the higher proportion of nonprotein nitrogen accompanied northern-grown rather than the rather inferior home-grown seed. Sulfated potato ash is suggested as an unchanging basis for comparison of analyses of potatoes before and after storage.

Some experience in rice hybridization, J. P. TORRES (*Philippine Agr. Rev.*, 20 (1927), No. 2, pp. 261-264).—The technique of emasculation, pollen collection, pollination, detection of fertilization, and ratooning is briefly outlined.

The Kolamba rice of the north Konkan and its improvement by selection, R. K. BEHDE and S. G. BHALERAO (*India Dept. Agr. Mem., Bot. Ser.*, 14 (1927), No. 7, pp. 197-245, pls. 7).—Kolamba rice, a variety noted for its high culinary quality, is grown on about 200,000 acres in the north Konkan of Bombay Presidency and is in great demand both in other parts of India and in eastern Africa. Its types, defects, and botanical characteristics are described, correlations are shown between a number of agronomic characters, and descriptions are given for eight selected strains.

Sugar beet seed breeding in Russia, I. V. YAKUSHKIN (*Facts About Sugar*, 23 (1928), No. 5, pp. 110, 111, 114).—A review of activities of the experiment station at Ramon in breeding sugar beets for productivity and resistance to storage losses, rotations, fertilizer studies, and cultural experiments.

The value of measuring growth of cane, H. J. RODRIGUES (*Facts About Sugar*, 23 (1928), No. 5, pp. 113, 119, figs. 4).—According to observations at the Louisiana Sugar Experiment Station, the relative growth of a sugar cane variety may be indicative of final yields.

A study of the flowering habits and flower characteristics of different sugar cane varieties at La Carlota Sugar Cane Experiment Station, S. ASUNCION and A. LABRADOR (*Philippine Agr. Rev.*, 20 (1927), No. 2, pp. 229-241).—No definite time for blooming and anther opening in sugar cane was observed. In 1924 the flowering season lasted from October 20 to December 22 and in 1925 from September 24 to November 10. The flowering age of sugar cane varieties ranged from 366 to 411 days. Forty of 50 sorts were well supplied with pollen, although the quantity was quite variable. From shooting to pollination required from 4 to 14 days, to complete emergence of arrow from 4 to 15 days, and to ripening of seed from 14 to 29 days. Varietal differences were noted in vitality and viability of the seed.

Seedling canes in Mauritius, H. TEMPANY (*Rev. Agr. Maurice*, No. 35 (1927), pp. 274-289, pls. 3).—The comparative sugar production and local significance of sugar cane varieties and seedlings are treated in some detail. In 1925-26 White Tanna was grown on about 58 per cent of the cane acreage on the island. D. K. 74 9, M. P. 55 8, M. P. 131 8, Striped Tanna 5, D. 109 3, D. 130 3, M. P. 33 1, Uba 1, and other sorts 4 per cent. B. 3390, R. P. 6, and 55/74 have given the most sugar per acre in elevations above 900 ft., and Sealy Seedling, P. O. J. 213, and D. 109 below 900 ft. R. P. 6, D. 109, and P. O. J. 213 led for the whole island.

A monograph of sugar-cane varieties, A. H. ROSENFELD (*Jour. Dept. Agr. Porto Rico*, 11 (1927), No. 1-4, pp. 334, pls. 30, figs. 6).—This compendium sets forth the characteristics and yield data and illustrates varieties of sugar cane described in Porto Rico, including those described earlier by Earle (E. S. R., 47, p. 635). Included papers are *The Varietal Revolution in Porto Rico*, by C. E. Chardón (pp. 9-41), and *General Remarks [on Sugar Cane Varieties]*, by F. S. Earle (pp. 46-81). The appendixes include simple characteristics for distinguishing similar varieties, a glossary, and a selected annotated bibliography of papers dealing with sugar cane varieties in Porto Rico. See also other notes by Earle (E. S. R., 46, p. 835) and by Rosenfeld (E. S. R., 54, p. 133; 55, p. 232).

Fertilizers for tobacco, E. C. WESTBROOK (*Tobacco*, 35 (1927), No. 6, pp. 20, 21; also in *Amer. Fert.*, 67 (1927), No. 13, pp. 36, 40, 42).—Analyses and rates and sources of plant foods are recommended for bright fire-cured tobacco and of dark tobacco (sun-cured and shipping) grown on average soils in Virginia, North Carolina, South Carolina, and Georgia from the results of experiments in those States. Interpretive comments by the author are appended.

[Tobacco production in Porto Rico] (*Tobacco*, 35 (1927), No. 10, pp. 19-55, figs. 63).—Papers in this number of interest to the agronomist include *Practical Suggestions for Improving Quality of Porto Rican Leaf*, by J. D. Stubbe (pp. 20, 21); *Actual Conditions Affecting the Prices of Porto Rican Tobacco*, by F. H. Bunker (pp. 22-24); *Statistical Tables Showing the Tobacco Acreage and Production* (p. 24); *Porto Rican Tobacco Seed Bed Difficulties and Suggestions*, by H. C. Henriksen (p. 25); *Porto Rico's Proposed Graduate School of Tropical Agriculture*, by C. E. Chardón (pp. 30, 31, 33); *Porto Rican Tobacco Investigation at the Experiment Station*, by J. A. B. Nolla (pp. 37, 39); and *Porto Rican Tobacco Grower-Manufacturer Situation Analyzed*, by F. M. Zeno (pp. 40, 45).

The seedbed factor in winter wheat production, T. A. KIESSELBACH, A. ANDERSON, and W. W. BURR (*Nebraska Sta. Bul. 223 (1927), pp. 31, figs. 3*).—Different methods of preparing the seed bed for winter wheat were compared for their effects on yield and quality during the period 1922–1926. Treatments for wheat after oats variously consisted of plowing July 15, August 15, or September 15 at depths of from 4 to 10 in., harrowing, various diskings before and after plowing, rolling, and several other operations. All plats were disked uniformly prior to seeding.

Late plowing was noticeably less productive than early and medium dates. The results indicated that with good management plowing supplemented by timely disking could extend over 5 or 6 weeks after harvest. A medium depth, up to 7 in., was favored by the yield data. One disking after early plowing and one or two before later plowing appeared to be worth from 3.4 to 6 bu. per acre. Combinations resulting in the highest average acre yields were disking July 15, plowing 7 in. deep August 15, and disking again just before seeding 28.9 bu., and plowing 7 in. deep July 15 and disking August 15 and just before planting 28.4 bu. Listing July 15, splitting the ridges August 15, and disking in September produced 27.8 bu. Wheat seeded in standing corn stubble averaged 17.1 bu. and in disked stalks 15.5 bu., but even then was more profitable than oats on disked stalks.

Delayed preparation seemed to reduce the rankness of vegetative growth, thereby increasing the proportion of grain to straw. There was a slight indication that the conditions retarding full growth tend to delay heading and maturity and result in a somewhat shorter straw. Early plowing and favorable seed-bed conditions resulted in a thicker stand and more tillering.

Considering the data from the cultural tests, milling and baking trials, and soil moisture and nitrate determinations, it was concluded that those seed-bed treatments which result in high yields also produce grain that is relatively high in protein content and baking strength. Likewise, those treatments which produced the higher yields showed the greatest nitrate development and moisture accumulation in the soil from July to October.

Rate and date of seeding and seed-bed preparation for winter wheat at Arlington Experiment Farm, C. E. LEIGHTY and J. W. TAYLOR (*U. S. Dept. Agr., Tech. Bul. 38 (1927), pp. 20, figs. 7*).—In experiments at Arlington, Va., during the period 1919–1924 Purplestraw winter wheat was seeded on September 15, October 5, and October 30 at acre rates of from 2 to 8 pk. on land variously plowed or disked. Comparative costs of different seed-bed preparations are discussed briefly.

After cultivated soy beans disked land produced 2.3 per cent more grain than plowed land and at a smaller cost for seed-bed preparation, although plowed land gave the greater straw yields. Land prepared by disking or plowing September 15 and seeded October 30 produced the highest average grain yields, although delaying of seeding until October 30 is attended with some risk. Preparation by disking or plowing 45 days before seeding October 30 resulted in considerably higher average yields than did both preparation and seeding October 30, but such differences were not observed between land prepared 20 days before seeding October 5 and land both prepared and seeded October 5. On land prepared by disking or plowing and seeded the same day the highest grain yields were obtained from seeding October 5, followed in order by October 30 and September 15.

The 6-pk. rate per acre returned the highest net grain yield, and the rates of 5, 7, or 8 pk. produced slightly less net yields. Slightly greater yield increases were obtained from sowing larger quantities of seed per acre when the seeding

was early than when it was late. No significant difference in the bushel weight of grain resulted from the different seeding rates or seed-bed preparations.

Wheats in central Montana, R. W. MAY (*Montana Sta. Bul.* 203 (1927), pp. 26, figs. 9).—Varietal and cultural experiments with winter and spring wheat in cooperation with the U. S. Department of Agriculture at the Judith Basin Substation are reported, with descriptions of leading varieties.

Winter wheat has outyielded spring wheat by more than 2 bu. per acre, although the latter winterkills less, commands a better price, and its seeding does not interfere with the harvest. Kharмонт and Montana 36 (both selections from Kharkof) winter wheat and Marquis and Supreme spring wheats are recommended for the section. Kharмонт has been less winter hardy than Minhardt and Minturki, although it was superior in average yield and in quality.

August 15 to September 12 has been the best period for seeding winter wheat, with from 4 to 5 pk. per acre, while spring wheat gave best returns seeded about April 21 and with from 3.5 to 4 pk. for the smallerkerneled varieties and from 4.5 to 5 pk. for the larger seeded sorts. Winter wheat furrow drilled survived winter with much better stands and averaged 5.1 bu. more than that seeded with the ordinary drill, whereas spring wheat yields favored the ordinary drill. While harrowing killed weeds in winter wheat, it did not increase average yields for either winter or spring wheat.

A comparison of Canadian and United States wheat standards, G. H. MORAN (*Montana*, 2 (1927), No. 2, pp. 12).—Comparative milling and baking tests were made by the Canadian Grain Research Laboratory at Winnipeg on samples of Montana-grown spring wheat representing different United States grades and Canada-grown wheat representing several Canadian grades. The data indicated that the Montana wheat of the northern spring class and grades is about equal to the Canadian wheat of similar grades, and that the Montana dark northern spring class and grades surpass either the northern spring of Montana or the Canadian wheat of corresponding grades. The flour yield of the Montana wheat is about equal although the test weights are lower, and the flour on the whole has a better color. The average loaf volume and textures of the dark northern Montana wheats and the northern spring Montana (to a lesser degree) are superior to the Canadian.

Selection of durum wheat, G. CONTI (*Selezione dei Grani Duri. Bari, Italy: Staz. Agr. Sper.*, 1927, pp. 101, figs. 26).—The agronomic characteristics and gluten contents are shown for 64 sorts of durum wheat.

Technical regulations for seed testing [trans. title] (*Landw. Vers. Sta.*, 107 (1927), No. 1-2, pp. 1-64).—Rules effective January 1, 1928, and evidently applicable in Germany are given for sampling and for the determination of purity, germination, viability, and other qualities of agricultural seed. The requirements for individual species are tabulated, and specific directions for seed of sugar and fodder beets and forest tree seed and for the inspection of potatoes are appended.

Weeds of cultivated crops in Northern Caucasus [trans. title], E. F. BOFARSKAYA (*Rostovo-Nakhtchevan. na Donu Oblastn. Selsk. Khoz. Opytn. Sta. Bul.* 201 (1925), pp. 66).—The species of weeds whose seeds are found in the seed of crop plants are tabulated and discussed for the Caucasus region.

Biological types of weeds and methods of eradicating them [trans. title], A. I. MAL'TSEV (MALTZEY) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, pp. 32-36).—The various types of weeds, such as annuals, perennials, rooting plants, and parasites, are discussed, and methods for the eradication of the individual types are outlined.

HORTICULTURE

Types of sterility in plants and their significance in horticulture, A. B. SROUT (*Mem. Hort. Soc. New York*, 3 (1927), pp. 3-8).—A broad outlook on the sterility problem as affecting horticultural plants, pointing out that sterility may be divided into two large groups, (1) sterility due to various environmental factors such as variation in food supply, water, and the like, and (2) that inherent in the plant due to hybridity, imperfect development of either sex, physiological incompatibility, etc. Emphasis is placed on the need of careful terminology; for example, the banana, pineapple, and seedless grapes are self-fruitful but self-sterile. The underlying causes of sterility in economic plants need to be determined, the subject deserving the combined consideration of the plant breeder, botanist, and practical grower.

Variation in rooting response of cuttings placed in media in different pH value, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 383-390, figs. 2).—Comparing granulated peat moss and sand as rooting media for azalea and privet, the peat was found more satisfactory for azalea and sand for the privet, but both species rooted well in a mixture by volume of half sand and half peat. Differences in percentage of rooting were not nearly as striking as was the character of the growth. No direct relation was recorded between callus formation and rooting, good rooting occurring without callusing and conversely abundant callusing without rooting. The addition of neutralizing chemicals reduced rooting in both azalea and privet cuttings in moss. However, other factors beside acidity, notably moisture content, are believed to have an important influence. An earlier paper on propagation by Zimmerman has been noted (*E. S. R.*, 56, p. 834.)

Node vs. Internode cuts for cuttings, C. C. STARRING (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 119-122).—That cuttings of some species root more easily from internodal cuts than from nodal cuts was indicated in studies at the Montana Experiment Station. In five tests with *Coleus* and two with Canada poplar the internodal cuttings yielded the greater amount of roots. With *Tradescantia* cuttings the covering of the nodes with sand was more important than the position of the cut.

[Horticultural investigations at the South Carolina Station] (*South Carolina Sta. Rpt. 1927*, pp. 25-31, 32-34, figs. 3).—As for the preceding year (*E. S. R.*, 56, p. 532), apple pollination continued to receive chief consideration, approximately 5,000 blooms of Winesap, Delicious, Arkansas, and Stayman Winesap being emasculated and hand pollinated in 1927. All four varieties were found self-sterile. Delicious proved a satisfactory pollinizer for the other three varieties and Early Harvest proved satisfactory for all four. The pollen of Arkansas, Winesap, and Stayman Winesap did not, and that of Delicious and Early Harvest did germinate satisfactorily in 12 per cent cane sugar solution. Data obtained in cooperative peach fertilizer tests at McBee and Gramling showed nitrogen to be the most important nutrient in influencing growth and yield. Nitrogen, however, delayed ripening from 2 to 10 days, depending on the season and the amount used. Phosphoric acid and potash proved of very little benefit. Cover crops of cowpeas in summer and rye in winter tended to retard fruit ripening.

Marked variations in yields were noted in strain tests with tomatoes. In Earliana the range was from 6+ to 10+ tons per acre, in Greater Baltimore from 6 to 11.5 tons, Bonny Best from 8 to 10.5 tons, and John Baer from 2 to 7 tons. Differences in the time of ripening were also observed. Of 9 wilt-

resistant tomatoes tested Marvel, Louisiana Red, and Louisiana Pink were the most productive.

Truck crop plants, H. A. JONES and J. T. ROSA (*New York and London: McGraw-Hill Book Co., 1928, pp. XIV+538, figs. 98*).—Arranged according to important genera, this text and reference book presents a comprehensive survey of vegetable growing in the United States, laying stress on the results of scientific investigations rather than on general cultural practice.

Effect of self-fertilization in cabbage and onion, F. KOROWSKI (*Mem. Hort. Soc. New York, 3 (1927), pp. 281-284*).—A comparison of the weights of young plants raised from seed resulting from the selfing and open pollination of Amager cabbage showed 22 per cent of increase in favor of the open fertilized plants. Similar observations were recorded in the Warsaw variety. It is believed that favorable cultural conditions tend to smooth down the differences between selfed and open pollinated seedlings.

In the Zittaner onion, bulbs from selfed flowers averaged 120 gm. as compared with 187 gm. for bulbs from crossed flowers. Weaknesses resulting from selfing were slight in both species, leading to the suggestion that inbred progenies may be successfully developed for breeding.

The rôle of sterility in the improvement of vegetables, C. E. MYERS (*Mem. Hort. Soc. New York, 3 (1927), pp. 261-266, pl. 1*).—Following a general discussion of sterility investigations with various vegetables, the author reports his inability at the Pennsylvania Experiment Station to secure seed from self-pollinated cabbage plants, whether grown in the field or greenhouse and irrespective of the thoroughness of hand pollination. Varying the length of light exposure, the water supply, and the time of day at which pollinating was performed had no influence on results.

Sterility in the common cabbage (*Brassica oleracea* L.), L. R. DETJEN (*Mem. Hort. Soc. New York, 3 (1927), pp. 277-280*).—Of various types of sterility, including incompatibility, intersexualism, abortion of the early buds, etc., observed in the cabbage, incompatibility is deemed the chief cause of unfruitfulness. Observations on the progeny of crosses between plants of known compatibility leads to the conclusion that the phenomena of incompatibilities are closely associated with hereditary units and transmitted as allelomorphous pairs. Intersexualism, that is, varying degrees of development of either pistils or stamens, was particularly prevalent in certain strains. Abortion of the first flower buds was noted on all cabbage plants. Protogynous flowers were of common and protandrous flowers of rare occurrence.

Environmental factors affecting seed-stalk development in celery, H. C. THOMPSON (*Mem. Hort. Soc. New York, 3 (1927), pp. 273-276, pls. 2*).—Supplementing an earlier paper (*E. S. R., 52, p. 139*), the author reports that the temperature to which celery plants are subjected during the early stages of their growth has a very marked effect upon the development of seed stalks. Of plants grown from seed sown February 10 and February 25, those kept in a warm greenhouse until set in the field failed to produce a single seed stalk, while those hardened in a cold frame from April 10 to May 14 developed 48.6 and 52.8 per cent of stalks, respectively. Plants from seed sown August 28 and held at a high temperature in the greenhouse did not bloom by June 1, irrespective of treatment, an effort being made to induce flowering by increasing light exposure. At the same time comparable plants held in a cool greenhouse all blossomed by May 1. It is believed that high temperature during the period of rapid development in some way inhibits the development of seed stalks.

Some freezing studies on celery, I. G. GONZALEZ (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 339-351).—Determinations at Cornell University of the freezing point in various parts of the celery plant showed very slight differences. The lowest, 29.112° F., was found in the heart of secondary shoots of Emperor and the highest, 30.878°, in the stem of Golden Self-Blanching. In full-grown celery plants the crown and roots showed the highest osmotic pressure. Exposure of seedlings to low temperature increased the osmotic pressure, a result the author believes due to slower respiration and less use of reserve foods. Measurements taken on the hearts of celery plants showed with one exception higher osmotic pressure in the sap of plants about to flower than in that of nonseeding plants, suggesting that an increase in available foods, principally sugars, is a controlling factor in the premature-seeding of celery.

The effect of certain external factors on the vigor of sweet corn, W. A. HUELSEN (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 221-231).—Studies at the University of Illinois showed that temperature, length of exposure to heat, and initial moisture content are important factors in the drying of sweet corn seed. Evergreen sweet corn having a 6 per cent moisture content and exposed to a temperature of 70° C. (158° F.) for periods ranging from 15 to 60 minutes suffered no loss of viability. Comparable seed held in moisture-saturated air for 72, 120, and 168 hours previous to exposure to 70° showed progressively increased injury in accord with increased moisture content. Corn picked at three successive intervals, with moisture contents at 69, 58.4, and 44.2 per cent, respectively, was injured when exposed for periods of 48, 72, and 96 hours to temperatures ranging from 36° to 43°. Temperatures slightly above freezing as well as those below again proved injurious to sweet corn in proportion to the moisture content.

Mushrooms and toadstools, H. T. GÜSSOW and W. S. ODELL (*Ottawa: Dominion Expt. Farms, Div. Bot.*, 1927, pp. 274, pls. 2, figs. 198).—An account of the more common edible and poisonous fungi of Canada, with suggestions in regard to use of the edible forms as food and in regard to culture.

Whence come the rogues in canning peas? R. A. BRINK (*Sci. Agr.*, 8 (1927), No. 3, pp. 163-170).—A discussion of the present status of knowledge upon the improvement of the canning pea, with particular attention to the occurrence and nature of the off types commonly characterized as rogues.

The chemical composition of the Des Moines (Table Queen) squash as affected by the age of the specimens, E. S. HABER and C. W. ARGUE (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 203-207).—Squashes harvested at weekly intervals from a carefully selected strain of the Des Moines variety were found to gain steadily in sucrose, starch, and proteins and to lose in reducing sugars, dextrin, and moisture as ripening progressed. As shown in baking tests, the increase in starch, sucrose, and proteins and the loss in moisture were correlated with gain in quality. The maximum content of carbohydrates in the early stages of growth indicated that quality is not dependent on the total percentage of carbohydrates in the dry weight.

Results of experiments with watermelons in 1923 and 1925 [trans. title], A. A. IVANOVA (*Rostovo-Nakhichevan. na Donu Oblastn. Selsk. Khoz. Opytn. Sta. Bül.* 203 (1926), pp. 29, figs. 3).—Two years' observations on the development of watermelons planted at various times indicated that the size of the plant, its growth, and its development depend primarily on temperature, also the determining factor in germination, length of the growing period, time of ripening, and yield. Soaking seed for 24 hours before planting increased the percentage of germination.

Productive orcharding: Modern methods of growing and marketing fruit. F. C. SEARS (*Philadelphia and London: J. B. Lippincott, 1927, 4. ed., rev., pp. [12]+315, pls. [9], figs. [141]*).—A revised edition of a previously noted work (E. S. R., 50, p. 140).

The activity of apple and filbert roots, especially during the winter months, G. H. HARRIS (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 414-422, figs. 6*).—Observations from early November to June upon the roots of established apple and filbert trees, some located in well drained and others in poorly drained areas, showed that where there was no submergence and temperature conditions were favorable, 40° F. or above, growth continued throughout the winter. No appreciable varietal differences were observed in apples. Filberts did not resume growth as quickly following unfavorable conditions as did apple roots. In the case of yearling Delicious trees planted in November in a prepared sand soil mixture, new roots appeared within a month of planting and continued forming throughout the winter and spring. Recovery from submergence was more rapid in sandy soils, due apparently to better aeration. In the presence of excess moisture the greater root activity was displayed in the region of the collar, and root systems were more extensive in sand than in soil.

With trees growing in a nutrient solution aeration or very frequent change of solutions was required to keep the trees thrifty. The introduction of carbon dioxide into the solution proved disastrous, producing results comparable to those induced by long continued submergence.

Some factors to be considered in the practical application of sterility studies of fruits, A. J. HEINICKE (*Mem. Hort. Soc. New York, 3 (1927), pp. 135-158*).—This is a contribution from Cornell University pointing out the importance of other factors than pollination in the setting of fruit.

Heavy pruning of unproductive 20-year-old Anjou pears lying adjacent to Seckel trees induced fruiting. Production on the lower limbs of 15-year-old Rhode Island trees while the upper limbs bore but little fruit was apparently associated with heavy pruning of the lower limbs. Similar observations of the effect of pruning on fruiting were made on McIntosh and Northern Spy trees. That heavy production in one year may be followed by poor setting the next was shown in a McIntosh orchard in the Champlain Valley where unsatisfactory set occurred despite abundant bloom and presence of other varieties. The thinning out of trees in closely planted orchards may also exert a beneficial influence on fruit set.

Studies on the sterility of the fruit trees in Russia, W. PASHKEVITCH (*Mem. Hort. Soc. New York, 3 (1927), pp. 175-189*).—A résumé of the results of self- and cross-pollination studies conducted in various places in Russia with apples and pears for the most part hardy varieties of the type of Alexander, Antonovka, and White Transparent. Among general conclusions are that no difference exists between the efficacy of pollen from the same flower, flowers of the same tree, or from other trees of the same variety. Cross-pollination was apparently more successful with young than with old trees of a single variety. Percentage of successful set was lower in the off than in the fruiting year. Pollen of *Pyrus ussuriensis* apparently induced fruit setting but not fertile seed formation in the Canada Reinette and Bauman apples.

Abortive and sterile apple pollen, E. KVAALE (*Mem. Hort. Soc. New York, 3 (1927), pp. 399-408*).—In presenting data obtained at the New York State Experiment Station and at the Norway Agricultural College upon the germination and growth of the pollen of 91 apple varieties, the author points out that these varieties divide naturally into two groups, a small group with germina-

tions less than 30 per cent and a large group with germinations of over 50 per cent. In the low group occur Arkansas, Baldwin, Gravenstein, Rhode Island, and Stayman Winesap.

Cross-pollination experiments showed a direct correlation between the pollen germination of the pollen parent and its success as a pollinizer, leading to the suggestion that varieties with pollen germination of 30 per cent or less should not be considered as dependable pollinizers.

The respiration of apples at low non-freezing temperatures and while frozen, D. B. CARRICK (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 277-285, figs. 2).—That respiration continues, although at greatly reduced rates, in solidly frozen apples was indicated in studies at Cornell University. An appreciable amount of carbon dioxide was released from rigidly frozen McIntosh apples held at a temperature well below the killing point. A definite relation that may be expressed by a logarithmic equation was observed between carbon dioxide output and the temperature. No freezing was recorded in Yellow Newtown apples at 29.3° F. or above. Ice formed in the fruit of a vinifera grape variety between 28.4 and 26.6°, between which points carbon dioxide response was very similar to that of apples. It is pointed out that although apples do not freeze at temperatures somewhat below 32°, many varieties, such as Rhode Island, McIntosh, and Baldwin, suffer physiological injuries at these low temperatures.

On the self-sterility of the Japanese pear, Y. ASAMI (*Amer. Soc. Hort. Sci. Proc.*, 23 (1926), pp. 122-127).—Studies at Tokyo Imperial University upon the pollination of the Chojuro pear previously reported as fully self-sterile showed that germination of the pollen grains occurs as freely in selfed as in crossed blooms, and that the growth rate of the pollen tube in selfed styles is equal to that in crossed styles. For some unknown reason the pollen tube in selfed flowers was stopped or at least greatly slowed down in rate of growth when it reached the base of the style, whereas the pollen tubes of crossed blooms continued rapid growth, entering in many instances the micropyle of the ovaries within 4 days. Even 16 days after pollination when ovules were beginning to show disintegration none of the tubes of selfed blooms had reached the locule. The inhibiting substances were apparently secreted in the ovule but not in the style.

Self and cross-sterility in the Japanese pear, A. KIKUCHI (*Mem. Hort. Soc. New York*, 3 (1927), pp. 233-241).—Observations at the Tottori Agricultural College, Japan, on 24 varieties of Japanese pears showed self-sterility to characterize this group. However, with most varieties there was considerable fluctuation in the percentage of sterility from year to year. Four cases of intersterility were noted in 106 crosses between varieties. Pollen germination was satisfactory with all varieties used. Back crosses of F_1 plants with their parents showed no sterility in combinations with the pistil parent but this was evident in crosses with the pollen parent. Cross-sterility occurred in crosses between sister F_1 seedlings.

The domestic production of cherry stocks, [R. WELLINGTON] (*Amer. Nurseryman*, 45 (1927), No. 10, p. 243).—Observations at the New York State Experiment Station upon the germination of cherry pits saved from open-pollinated fruits showed a definite association between the season of ripening and the viability of the seed in sweet varieties. Early maturing varieties produced seed of low viability, medium season varieties seed of moderate viability, and late season varieties, such as Downer and Oswego, seed of high viability, an observation deemed of value to nurserymen interested in the production of cherry stocks. The poor germination of the seed of early ripening peaches was recorded by Connors (*E. S. R.*, 57, p. 737).

A study of field plot technique with strawberries, A. N. WILCOX (*Sci. Agr.*, 8 (1927), No. 3, pp. 171-174, fig. 1).—Plat experiments conducted by the Minnesota Experiment Station with the Minnehaha strawberry indicated the practicability of using rather small plats, provided they are systematically arranged and replicated. As measured by the coefficient of variability, variability was reduced somewhat by increasing the size of the plats, 20.2 for $\frac{1}{16}$ -acre and 14.1 for $\frac{1}{4}$ -acre plats. Replication was even more effective, the average coefficient of variability for one $\frac{1}{16}$ -acre plat being 16.5 as compared with 9.7 for four replications and 7.0 for eight replications.

A study of flower bud formation in the Dunlap strawberry, J. U. RUEF and H. W. RICHEY (*Amer. Soc. Hort. Sci. Proc.*, 22 (1925), pp. 252-260).—Microscopical examination at the Iowa State College of the buds of the Dunlap strawberry indicated that flower bud differentiation in field-grown plants occurs over a protracted period from early September onward. Contrary to the results of Goff (*El. S. R.*, 13, p. 18), who found that flowers appeared on the rooted runners at practically the same time as on the parent plant (Clyde variety), the authors found a progressive development leading to the suggestion that differentiation and development of the strawberry flower bud is influenced by an internal nutritive condition which is attained first in the older plants. Observations on the relation of the time of differentiation to winter injury indicated that the earlier the date and the more fully developed the flower stalk the greater is the resistance to winter injury.

Studies of the influence of various fertilizers on flower bud differentiation and development indicated that superphosphate (acid phosphate) hastens and nitrogenous fertilizers and muriate of potash retard this process.

Sterility in the strawberry and its solution, G. M. DARROW (*Mem. Hort. Soc. New York*, 3 (1927), pp. 191-193).—Cultivated varieties of strawberries derived entirely or chiefly from hybrids of *Fragaria virginiana* and *F. chiloensis* show two flower types, pistillate and hermaphrodite, both of which are more or less sterile. Records taken at the Horticultural Field Station, Maryland, showed one hermaphroditic variety, Rockhill, to be apparently fertile in all its blooms. Sterility was influenced by environmental conditions, such as soil variability. Within a single inflorescence the primary flowers are more often fertile than the later appearing blooms. This relation was not affected by the removal of the first blooms, even by frost injury in their earliest bud stage. In Dunlap greater sterility was noted in the flowers of the lateral than in the central cluster.

Sterilities in carnations, with special reference to intersexes, C. H. CONNORS (*Mem. Hort. Soc. New York*, 3 (1927), pp. 51-54, pl. 1).—Great variability was observed at the New Jersey Experiment Stations in carnation flowers in respect to the relative development of pistils and stamens. In general, the carnation was found to be in a dichogamous condition but tending toward dioeciousness when allowed to self-fertilize. The selfing of either perfect or fluctuating hermaphrodite flowers tended to decrease maleness, while crossing tended to maintain this character. Aberrant or monstrous forms occurred more frequently in selfed than in crossed lines.

Self-sterility in rhododendrons, H. F. COMBER (*Gard. Chron.*, 3. ser., 77 (1925), No. 2001, pp. 300, 301, figs. 6).—It is claimed that cross-pollination in the genus is always beneficial and is often the deciding factor in the production of seed. Since rhododendrons are so prolific when cross-pollinated it is always possible to reduce the number of fruits and yet be sure of plenty of seeds.

Rapid flowering of early tulips, I. LUYTEN (*K. Akad. Wetensch. Amsterdam, Proc.*, 30 (1927), No. 4, pp. 502-513, pls. 2).—Studies in the plant physiology laboratories at Wageningen, Holland, with the early single flowering tulip

Van der Neer, showed that the storage temperature following digging has an important relation on the time of blooming of forced plants. When held at 17° C. (62.6° F.) from the time of digging to the time the first whorl of tepals could be detected as individual protuberances, bulbs came into blossom from 5 to 7 days sooner than when held at 20° during the same period. Following this stage the bulbs were transferred to a temperature of 48.2° F., planted after a month's delay, and kept in a cool environment until the sprouting leaves had reached about 4.5 cm. (1.8 in.) in length.

Dahlias and gladioli, H. A. SANDHACK (*Dahlien und Gladiolen. Berlin: Paul Parey, 1927, pp. [6]+268, pls. 12, figs. [156]*).—Illustrated partly in color, this text discusses in detail the early history and development of these two popular garden flowers, their types and varieties, methods of breeding and propagation, general cultural requirements, control of pests, etc.

Breaking the rest period in gladiolus, R. B. HARVEY (*Amer. Gladiolus Soc. Off. Bul., 4 (1927), No. 6, pp. 10, 11*).—At the Minnesota Experiment Station four lots of gladiolus corms treated for 6 days prior to planting with air, ethyl ether, chloroform, and ethylene gave germinations of 5, 100, 80, and 80 per cent, respectively, 32 days following planting in soil. In respect to effect on the rate of growth, ethylene, 1 to 1,000 parts of air, gave the best results. Six days was found sufficient to give the desired stimulation.

A preliminary report on the stimulation of growth of bulbs and seeds with ethylene, E. S. HABER (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 201-203*).—Yellow onion sets treated for 24 hours with ethylene yielded green bunch onions averaging 10.45 cm. in diameter as compared with 7.8 cm. for controls. The mature onions of the treated lot weighed 17 per cent more than those of the controls. The treatment of dormant onions of the summer crop with ethylene chlorohydrin retarded growth and in heavy doses proved lethal. Ether was also unsuccessful.

Under proper conditions the treatment of Paper White narcissus bulbs with ethylene and ethylene chlorohydrin hastened blooming. Treatment with ethylene hastened the maturity of sweet corn seed but had no effect on asparagus, radish, pepper, and tomato. Ethylene chlorohydrin in concentrations as low as 0.5 cc. per liter proved toxic to asparagus, and ethylene oxide, 0.5 cc. per liter, proved lethal to corn and radish seeds.

FORESTRY

Soil changes and silviculture on the Harvard Forest, R. T. FISHER (*Ecology, 9 (1928), No. 1, pp. 6-11, pl. 1, fig. 1*).—That the forest flora has a notable influence on the soil was shown in studies at the Harvard Forest, Petersham, Mass. Beneath an 80-year-old stand of white pine, *Pinus strobus*, there was found a thick layer of raw humus and a strongly podsolized horizon beneath which lay a typical burnt sienna or enriched stratum. Under an adjacent 18-year-old hardwood stand there was found a true mull profile. In this case the rate of decomposition of the raw humus was rapid, less than a single year's leaf fall remaining on the surface. The hardwood soil closely resembled garden loam in porosity, color, and texture, and was found to contain many earthworms. Since mixed stands of hardwood and white pine are secured more cheaply than pure pine, and since they greatly improve soil conditions, they are recommended as representative of good silviculture and sound economics in this region.

Natural regeneration of *Larix dahurica* [trans. title], S. Goro (*Jour. Col. Agr., Hokkaido Imp. Univ., 18 (1927), No. 5, pp. 207-306, pls. 3, figs. 3*).—Field observations in Chosen (Korea) and North China and experimental studies in Sakhalin (Sachalin) showed that forest fires have an important function in

the origin of larch forests. The charred materials discovered in the upper soil layer of larch forests apparently supplied a physical and chemical environment favorable to larch regeneration. Because of this fact surface fires are often purposely started from 4 to 7 years prior to cutting. According to investigations in Sakhalin the favorable effect of fire is increased if strips or areas of soil are exposed by removing the cover and by cutting the grass and herbs. The removal of the old stand is delayed until the young larch has become somewhat established. Successful regeneration is more certain if the surface fire is ignited in a seed year. A mixed stand of larch, fir, and spruce is encouraged by the previous removal of the soil covering.

The oil palm in Malaya, E. BUNTING, B. J. EATON, and C. D. V. GEORGI (*Malayan Agr. Jour.*, 15 (1927), No. 9-10, pp. 297-386, pls. 27).—A general account dealing with the early history, general culture, methods of harvesting, extraction of the oil, etc.

Tree planting in South Africa, T. R. SIM (*Pietermaritzburg: Natal Witness, Ltd.*, 1927, pp. 452, [pls. 41]).—A general discussion.

Common trees of Massachusetts, J. S. ILLICK (*Washington, D. C.: Amer. Tree Assoc.*, 1927, pp. [1]+110, figs. 72).—This contains illustrated material of use in identification.

Red squirrel damage to coniferous plantations and its relation to changing food habits, N. W. HOSLEY (*Ecology*, 9 (1928), No. 1, pp. 43-48, pl. 1).—Bud injury to various species of conifers growing in the Harvard Forest, Petersham, Mass., was found to be caused by red squirrels, which during periods of deep snow and consequent low food supply fell to eating tree buds. Of several species, Scotch pine suffered most, followed closely by Norway spruce and white pine. The disappearance of the chestnut and the replacement of old seed-producing stands with young cut-over forests are believed to be contributing factors to the situation.

Wood and lumber, A. C. NEWELL (*Peoria, Ill.: Manual Arts Press*, 1927, pp. 211, pl. 1, figs. 22).—A technical discussion of the structure, physiology of growth, characteristics, and chemistry of the wood of various trees, with information upon lumber grades, classification, and manufacture.

Timber measurement, W. TISCHENDORF (*Lehrbuch der Holzmassenermittlung. Berlin: Paul Parey*, 1927, pp. XI+218, figs. 37).—A comprehensive discussion of various methods and formulas for determining the height, volume, age, etc., of standing and cut timber.

DISEASES OF PLANTS

Plant disease investigations (*South Carolina Sta. Rpt.* 1927, pp. 45-48, fig. 1).—Oat smut is reported to have been unusually prevalent during the year, infections of 90 per cent or more having been reported for some fields, with an average of 38 per cent for the eastern part of the State.

The fungus wilt of tomatoes continued to cause much damage to that crop where resistant varieties were not planted, 90 per cent of some of the commercial varieties having been attacked, as compared with 55 per cent of the varieties Stone and Livingston Globe, both of which are somewhat resistant.

A leaf spot of pear trees caused by *Fabraea maculata* was noted at the station on varieties that are resistant to blight. A blighting of soy beans by *Sclerotium rolfsii*, a pod spot of Lima beans due to *Diaporthe phaseolorum*, and a powdery mildew of crêpe myrtle are also reported.

Successful single spore cultures have been made of *Macrophomina phaseoli*, which causes the ash stem blight of bean plants. Some evidence was secured which is said to indicate the identity of this species with that which causes the charcoal rot of sweet potatoes.

A short survey of the principal diseases of cultivated plants in North Caucasus during 1925 [trans. title], N. I. ANDREEV (ANDREIEV) (*Izv. Sev. Kavkazsk. Kraev. Sta. Zashch. Rast. (Bul. North. Caucasian Plant Protect. Sta.)*, No. 2 (1926), pp. 3-18).—The survey covers diseases of field crops, orchards, grapes, and vegetables. Smuts are the most widespread among cereals, *Monilia fructigena* among apple, pear, and plum fruits, and *M. cinerea* among plums and cherries. Grape culture in the district is highly developed, though the annual losses from diseases, especially mildew, amount to several million dollars. Of the vegetable crops the tomato suffers heavily from rots, the rot-producing fungi *Macrosporium lycopersicum* and *Fusarium lycopersicum* having been recognized. The disease caused by *Septoria lycopersici* was responsible for the complete destruction of some plantations. Pumpkins suffered from pink spots caused by *Gloeosporium lagenarium*. Potatoes were attacked by *Phytophthora infestans*, and cabbage by broom rape (*Orobancha mutell*). Beans suffered from rust (*Uromyces appendiculatus*). Tobacco, one of the most important crops of the district, suffered from mosaic and from white spotting of the leaves due to *Phyllosticta tabaci*.

Bacterium tumefaciens in crown gall tissue of plants [trans. title], J. MAGROU (*Compt. Rend. Acad. Sci. [Paris]*, 183 (1926), No. 19, pp. 804-806).—The author has observed, as have Smith (E. S. R., 48, p. 142) and others named, the usually superficial situation of bacteria (*B. tumefaciens*) in galls associated with the organisms, and has made studies on the results of superficial inoculation (with washings from tomato crown galls) of *Pelargonium* with *B. tumefaciens*. Observations indicated suggest that the cause of plant galls acts at a distance and by means of a mechanism not yet discovered.

Holcus bacterial spot on species of *Holcus* and *Zea mays*, J. B. KENDRICK (*Phytopathology*, 16 (1926), No. 3, pp. 236, 237).—A technical description is given of *Bacterium holci* n. sp., which is said to cause leaf spots on sorghum, Sudan grass, Johnson grass, pearl millet, sweet corn, and yellow foxtail grass.

Mosaic diseases on differential hosts, J. JOHNSON (*Phytopathology*, 16 (1926), No. 2, pp. 141-149, pls. 5).—In a previous contribution (E. S. R., 54, p. 249) the author reported on mosaic diseases of tobacco produced by virus obtained from apparently healthy potatoes. In the present paper descriptions are given of mosaic diseases of tobacco, tomato, and other solanaceous plants aside from the potato.

In addition to the ordinary tobacco mosaic, cucumber mosaic, petunia mosaic, speckled tobacco mosaic, and mild tobacco mosaic are described. These mosaic diseases are said to show differences from tobacco mosaic and from each other primarily through their behavior on differential hosts.

Mosaic [trans. title], A. POMPEU DO AMARAL (*Bol. Agr. [Sao Paulo]*, 27. ser., 1926, No. 4-5, pp. 147-156).—This general account deals with the history, characters, and control of mosaic.

A comparative study of the mosaic diseases of cucumber, tomato, and *Physalis*, M. N. WALKER (*Phytopathology*, 16 (1926), No. 7, pp. 431-458).—The author presents results of experiments to determine the properties of the infective principle, or virus, from typical cases of mosaic on the cucumber, tomato, and cultivated ground cherry. These experiments include studies on the reactions of the various infective principles to aging, drying, heat, alcohol, dilution, and filtration. The infective agencies in the juices of mosaic tomato and ground cherry were found to behave in practically the same manner as the virus of tobacco mosaic. The cucumber mosaic differed somewhat in its character.

The author's experiments appear to indicate that the properties of the mosaic virus of a given plant may be decidedly changed by transferring it to

another host, and that the properties of the viruses of certain species appear to be the same no matter what the source of infection. This is considered to indicate that there may be a single causal agent for the mosaic diseases here reported upon.

Relation of oxygen to spore germination in some species of the Peronosporales. B. N. UPPAL (*Phytopathology*, 16 (1926), No. 4, pp. 285-292).—Experiments are reported upon which were conducted to determine the ability of spores to germinate in the absence of oxygen. Conidia of *Phytophthora colocasiae* under proper temperature conditions were found to form zoospores in cultures from which the air had been exhausted by means of a vacuum pump, as well as in cultures from which the oxygen had been withdrawn by alkaline solutions of pyrogalllic acid. Indirect germination also occurred in the case of conidia of *P. infestans*, *P. palmivora*, and *P. parasitica* in the absence of oxygen. Direct germination did not occur with the conidia of any of the species of *Phytophthora* used when oxygen was excluded from the cultures. The conidia of *Aldugo candida*, *Plasmopara viticola*, and *Sclerospora graminicola*, which germinate indirectly, as well as the conidia of *Peronospora parasitica* and *P. trifoliorum*, which germinate directly, were found to require the presence of oxygen for germination.

Preliminary report of some observations on ascospore discharge and dispersal of conidia of *Venturia inaequalis*. J. E. HOWITT and W. G. EVANS (*Phytopathology*, 16 (1926), No. 8, pp. 559-563).—The authors claim that the mean temperature of the winter months, especially of January, February, and March, has a marked influence upon ascospore development and primary discharge in the spring in *V. inaequalis*. In Ontario, ascospores were found to retain their vitality until August 8, and probably later.

Revised method for the quantitative determination of sulfur fungicides on foliage. H. W. FITCH (*Phytopathology*, 16 (1926), No. 6, pp. 427, 428).—A modification is given of a method previously described (E. S. R., 58, p. 43) for the determination of sulfur fungicides on foliage. The revised method is said to be much more accurate than that previously described.

Seed grain disinfection with mercury preparations [trans. title], J. BODNAR (*Pflanzenbau [Berlin]*, 3 (1927), No. 24, pp. 375-379).—Condensed and partly tabulated accounts, including results in each case, are given of tests against wheat stinking smut with the mercury compounds Uspulun, Germisan, Hlgosan, and Agfa, and against oat loose smut with the same germicides.

Wet and dry seed grain treatments [trans. title], K. WESTERMEIER (*Pflanzenbau [Berlin]*, 3 (1927), No. 23, pp. 366-369, fig. 1).—Comparisons are made between various seed grain treatments applied dry and the same under wet conditions. Seeds in the pots exposed to rain came up some days later than in the other pots, and those treated with Uspulun came up a day or two earlier than those treated with any of several other compounds named. The wet method of treatment is on the whole preferred.

The effectiveness of various fungicides in controlling the covered smuts of small grains. E. B. LAMBERT, H. A. RODENHISER, and H. H. FLOR (*Phytopathology*, 16 (1926), No. 6, pp. 395-411).—The results are given of cooperative experiments on the control of covered smuts of grains carried on under the auspices of the Crop Protection Institute in 11 States of the United States and 4 Provinces of Canada.

The primary object of the investigation was to compare the general effectiveness of the copper-carbonate dust treatment with the standard formaldehyde treatment. Several other materials were tested, among them nickel-carbonate dust, copper-sulfate dust with a lime dust added, Semesan dust, and solutions of Uspulun and Semesan.

Copper-carbonate dust was found the most satisfactory of the materials tested for controlling bunt of wheat and smuts of hull-less oats. Formaldehyde controlled the smuts of these cereals more completely than any of the other materials tested, but it often injured the seed. Solutions of Uspulun and Semesan were not as effective as formaldehyde. Haskell's formaldehyde spray method (E. S. R., 39, p. 248) appeared to be the best treatment for hulled oats, for which it was much more effective than copper carbonate, the best of the dusts tested for this purpose. The experiments with barley are said to be somewhat inconclusive, but formaldehyde appeared to control covered smut better than the other treatments and none of the treatments injured the barley seed. In most cases no definite conclusions could be drawn regarding the effect of the different treatments on yields. However, the results obtained from treating badly smutted hull-less oats with copper-carbonate dust were so consistent and outstanding that the treatment was considered responsible, in part at least, for the increased yield.

Further experiments on the control of bunt of wheat and the smuts of barley and oats, R. W. LEUKEL (*Phytopathology*, 16 (1926), No. 5, pp. 347-351).—Tests were reported of about 20 dusts used in experiments for the control of bunt, in which copper carbonate was found to be very satisfactory from the standpoint of germination, control, and yield, even when containing only 18 per cent of metallic copper. Its low cost and abundant supply are considered to make it the logical dust for recommendation to farmers. Other dusts gave equal or superior control, but their high cost or limited supply would prevent their extensive use.

Germisan, Uspulun, and Semesan, in the order named, were most effective for combating covered smut of barley and the covered and loose smuts of oats. Formaldehyde controlled these smuts but caused some injury to seed.

Soaking oats and barley in water before sowing is reported to have increased the amount of smut.

The fusariosis of cereal crops in European Russia in 1923, M. DOUNIN (*Phytopathology*, 16 (1926), No. 4, pp. 305-308).—The author states that the summer of 1923 was an extraordinarily wet one in European Russia, and this is believed to account for the widespread prevalence, of *Fusarium* species on cereals. The practice of drying grain before threshing, in specially constructed sheds provided with stoves without chimneys is considered a good one, as apparently a large portion of the fungi are killed. When grain was shocked and allowed to stand in the field it was heavily infected.

Both rye and flax, which are used as food, were found to be poisonous when severely attacked by *Fusarium*, and this property was also found to be retained by linseed oil, which is also used as food.

The comparative effect of the dry method of seed disinfection on the development of barley smut [trans. title], V. I. ROMASHKIN-POL'SKIĬ (ROMASHKIN-POLSKY) (*Izv. Sev. Kavkazsk. Kraev. Sta. Zashch. Rast. (Bul. North Caucasian Plant Protect. Sta.)*, No. 2 (1926), pp. 46-49).—The following treatments were tested: Copper sulfate, 1 per cent solution, in contact with the seed for 10 minutes; corrosive sublimate, 0.1 per cent, in contact 15 minutes; formalin, 0.13 per cent, 30 minutes; potassium permanganate, 0.2 per cent, 15 minutes; water, 25 to 27° C., for 4.5 hours, and 56 to 60° for 10 minutes (in both cases the seeds were killed); water, 25 to 27°, for 1 hour, and 51 to 58°, for 10 minutes; dusting with anhydrous copper sulfate and slacked lime, 1 gm. per 100 gm. of seed; and dusting with copper carbonate, 1 gm. per 100 gm. of seed.

The seeds had in each case been dusted before the treatment with spores of *Ustilago hordei*, so that each seed had about 90,000 spores. The seeds after treatment were tested in the laboratory for germinating power or planted in the open. The results showed that the germination in the field was different from that in the laboratory. The highest germination was obtained from seeds treated with copper carbonate. The best disease control was obtained with the hot water treatment, though since germination was decreased by this treatment it is not recommended. The next best control was obtained with bichloride of mercury, followed by copper sulfate. Among the dusts, the anhydrous copper sulfate proved to be the best and the permanganate the poorest as regards effect.

Seed treatment experiments for controlling stripe disease of barley, R. W. LEUKEL, J. G. DICKSON, and A. G. JOHNSON (*Phytopathology*, 16 (1926), No. 8, pp. 565-576).—A detailed account is given of experiments conducted cooperatively by the U. S. Department of Agriculture and the Wisconsin Experiment Station on the control of barley stripe by some of the newer liquid and dust organic mercury and arsenic compounds. A preliminary account of this work has been previously noted (E. S. R., 55, p. 844).

According to the data presented, it appears that either Germisan or Uspulun produced the best results, depending on the purpose of the treatment. Several of the treatments were found to be superior to the formaldehyde and copper-sulfate treatments, which invariably produced seed injury. None of the dusts used had any apparent effect on the germination of the seed, and all decreased the amount of stripe to some extent. The effectiveness of dust treatments for stripe disease is believed to depend to a great extent on the amount of moisture in the soil at the time of sowing the seed.

Bacterial stalk rot of corn, H. R. ROSEN (*Phytopathology*, 16 (1926), No. 4, pp. 241-267, pls. 3, figs. 5).—In 1919 the author called attention to a little known bacterial disease of corn in Arkansas (E. S. R., 41, p. 747). Further investigations have shown that this disease occurs not only in Arkansas but in a number of other parts of the United States. The disease primarily affects the stalks and leaves, producing light or dark brown rotting of the bases of the leaves and a rotting of the lower portion of the stalk. Infection was found to take place through hydathodes, stomata, and through injuries resulting from the extrusion of endogenous roots, and from insects. A technical description is given of the organism *Phytomonas dissolvens* n. comb.

Formaldehyde and iodine dusts for the control of oat smut, J. D. SAYRE and R. C. THOMAS (*Ohio Sta. Bimo. Bul.*, 13 (1928), No. 1, pp. 19-21).—Some results are given of experiments with new dust treatments devised by the authors for the control of oat smut (E. S. R., 58, p. 445).

Formaldehyde dusts, made by adding 40 per cent formaldehyde to charcoal or infusorial earth so as to represent from 3.3 to 9 per cent of the formaldehyde in the commercial material used, and a dust composed of 5 per cent finely ground iodine mixed with infusorial earth controlled smut almost perfectly at a cost of about 5 cts. per bushel of seed treated.

Smuts of wheat and rye and their control, W. H. TISDALE and V. F. TAPKE (*U. S. Dept. Agr., Farmers' Bul.* 1540 (1927), pp. 11-17, figs. 8).—Popular descriptions are given of various smut diseases of wheat and rye, and treatments of the seed grain are recommended for the control of the various diseases. For the stinking smuts the copper carbonate method of treatment is advised, for the loose smuts the hot water method, and for the stem smut of rye either the formaldehyde or copper carbonate treatment is recommended.

A detailed account of the copper carbonate treatment of seed grain and a tabular statement of seed treatments and directions for applying them for the control of all cereal smuts are given.

Physiologic specialization in the leaf rust of wheat, *Puccinia triticina*, E. B. MAINS and H. S. JACKSON (*Phytopathology*, 16 (1926), No. 2, pp. 89-120, pls. 4).—The results are given of a study of the leaf rust of wheat made to determine whether there are physiologic forms of this rust such as have been found for the stem rust, *P. graminis tritici*.

The investigation showed that there are at least 12 physiologic forms, distinguished by the manner in which they infect 11 selected differential strains of wheat. The physiologic forms of the rust are said to be distinguished by the reaction shown by these varieties when infected with leaf rust, but no form was found to which all of the varieties were susceptible. The physiologic forms were not generally found pure in the field, but nearly always several were found mixed together. The physiologic forms were found to be neither fixed nor limited in their distribution.

In the progress of these investigations it was found that agronomic varieties of wheat were not necessarily uniform in their reaction to leaf rust, and different strains of such varieties varied markedly in their reaction.

Berberis fendleri, an alternate host of *Puccinia graminis tritici*, L. W. DURRELL and E. A. LUNGEN (*Phytopathology*, 16 (1926), No. 3, pp. 234, 235).—The authors report that the native barberry (*B. fendleri*) of the Rocky Mountain region is a host of wheat stem rust.

Peronospora parasitica attacking cabbage heads, T. H. THUNG (*Phytopathology*, 16 (1926), No. 5, pp. 365, 366, fig. 1).—A disease of cabbage heads is described which is caused by *P. parasitica*. The author's investigations indicate that the *Peronospora* occurring on *Capsella bursa-pastoris* is of a different strain and does not attack cabbage. The white cabbage varieties are reported more susceptible than the red ones.

Rhizoctonia crown rot of carrots, R. P. WHITE (*Phytopathology*, 16 (1926), No. 5, pp. 367, 368, fig. 1).—A crown rot of carrots due to *Rhizoctonia* is described. The fungus is considered to be a weak parasite on carrots, infecting at the crown only under conditions of high humidity.

The importance of controlling celery blight in the seedbed, A. G. NEW-HALL (*Phytopathology*, 16 (1926), No. 7, pp. 467-472, fig. 1).—Late blight (*Septoria apii*) and bacterial blight or leaf spot (*Pseudomonas apii*) are reported to cause considerable damage to small plants in out-of-doors seed beds. When from 2 to 4 applications of 20-80 copper-lime dust were made while the plants were in the seedling stage, a marked reduction in subsequent blight development was observed throughout the season in 6 out of 10 fields.

Factors affecting the development of flax rust, *Melampsora lini*, H. HART (*Phytopathology*, 16 (1926), No. 3, pp. 185-205, figs. 2).—The investigations reported are said to indicate that epidemics of flax rust may occur each year under normal conditions. Cool, moist weather, the most favorable condition for the growth of flax, is also conducive to the development of the rust. The disease is checked by hot, dry weather, as the maximum temperature for spore germination of the rust is from 26 to 27° C. It was found that the spores must be in contact with water in order to germinate, but if plants are wet for only a short time they may become infected. Light appeared to have little effect on spore germination and entrance of the germ tubes into the host.

The fact that *M. lini* was found not to be restricted to common flax suggested the possibility that wild flaxes might be dangerous sources of infection in flax-growing areas. So far as determined, *Linum lewisii* is not believed to be a

source of infection, as the rust occurring on this species probably does not attack the cultivated species. The wild species, *L. rigidum*, is attacked by the rust from common flax, and it is believed that it might be a source of infection for the cultivated crop. The use of resistant varieties is believed to afford the only practical means of controlling flax rust.

Virus diseases and the grafting of the hop, E. S. SALMON and W. M. WARE (*Gard. Chron.*, 3. ser., 77 (1925), No. 2002, pp. 320-322, figs. 2).—Since only experimentation can determine whether there may exist apparently unaffected hop and other carriers of hop mosaic and grafting is one of the means for answering this question, the authors indicate what is claimed to be a practicable and easy method of grafting the hop plant. Observed or possible results of grafting, particularly of distinct species, as *Humulus lupulus* and *H. americanus*, are also discussed.

[Onion anthracnose], R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo]*, 27. ser., 1926, No. 4-5, pp. 157-159, fig. 1).—The author has noted a new type of onion anthracnose, the organism of which is here treated as the new species *Colletotrichum allii*.

Black-leaf of peas caused by *Fusicladium pisicola* n. sp., M. B. LINFORD (*Phytopathology*, 16 (1926), No. 8, pp. 549-558, pls. 2).—Black leaf of peas, a newly described disease, is said to be characterized by dark olivaceous gray to black elongated spots on the lower side of leaves and on petioles and tendrils. This disease is said to occur in three valleys in northern Utah where peas are grown for canning, and in the seed pea-producing area of the Snake River Valley, Idaho. The disease is said to be caused by *F. pisicola* n. sp., a technical description of which is given.

The nature of resistance to footrot caused by *Ascochyta* sp. and some other fungi in the epicotyl of the pea, G. G. GILCHRIST (*Phytopathology*, 16 (1926), No. 4, pp. 269-276, pl. 1, fig. 1).—Previous investigations of Jones (E. S. R., 50, p. 839) are said to have shown that many dying pea plants were attacked at the base of the epicotyl more frequently than elsewhere in the underground stem or root. The fungi which cause foot rot of peas in Wisconsin include a species of *Ascochyta*, and the present contribution gives the results of an investigation on the characteristics of the basal portion of the epicotyl which render it especially susceptible to invasion. It appears from this work that deficiency or absence of cuticle at the base of the epicotyl is one of the conditions which makes this region particularly susceptible to disease of the foot rot type, and that varietal differences in susceptibility may be due in part to differences in the degree of cuticularization of this region.

Resistance of peas to rootrot, F. R. JONES (*Phytopathology*, 16 (1926), No. 7, pp. 459-465).—In a previous publication (E. S. R., 53, p. 351) suggestions were made regarding the methods whereby resistant varieties of peas escape injury caused by *Aphanomyces euteiches*. The present paper gives additional data secured in a study of resistance in peas in 1924 and 1925. A report is given of the behavior of three resistant and three susceptible varieties of peas toward *A. euteiches*, in which it is concluded that resistance, as observed in the field, is due to several factors. Resistant varieties remained comparatively free from fungus invasion in the vascular cylinder of root and epicotyl after the cortex was destroyed by *Aphanomyces*, while susceptible varieties were quickly invaded. In field trials in 1925 root rot was largely prevented by drought. Susceptible varieties, however, were either damaged or destroyed by a wilt disease, while the resistant ones remained free from apparent injury.

Pseudomonas (*Phytomonas*) *pis*, the cause of a pod spot of garden peas, C. A. LUDWIG (*Phytopathology*, 16 (1926), No. 3, pp. 177-183, pl. 1; *abs. in Phytopathology*, 16 (1926), No. 1, p. 75).—A preliminary announcement and a

detailed account are given of a pod spotting of peas in South Carolina caused by attacks of *Pseudomonas* *plst.*

Anthrachnose of pepper (*Capsicum annuum*), B. B. HIGGINS (*Phytopathology*, 16 (1926), No. 5, pp. 333-345, pls. 2).—In a previous publication (E. S. R., 49, p. 346) the author reported the occurrence of pepper anthrachnose in Georgia. Further studies have been made that show that several species of *Gloeosporium* and *Colletotrichum* occur on the fruits and other parts of the pepper plant, but apparently *G. piperatum* is the only species that is actively parasitic. The entrance through the cuticle is said to be gained apparently by a cutin-dissolving substance produced by the appressorium or by the infection tube. The fungus mycelium is believed to secrete some toxic substance which kills the host cells before they are actually penetrated by the advancing hyphae. The cellulose and hemicellulose membranes of the host tissue were found to be readily destroyed by the fungus, but cutinized and lignified membranes decayed very slowly.

It is stated that the spores of the fungus become attached to the surface of the pepper seed during the process of cleaning and washing and attack the young seedlings as they emerge from the seed coat. Surface disinfection of the seed greatly reduced the amount of seedling infection.

Potato dusting and spraying in 1927, P. E. TILFORD (*Ohio Sta. Bmo. Bul.*, 13 (1928), No. 1, pp. 21-23).—In continuation of experiments in spraying and dusting potatoes (E. S. R., 57, p. 144), plat tests were made in which Bordeaux mixture in liquid form was compared with a dust composed of monohydrated copper sulfate and hydrated lime and several commercial dusts. The sprays and dusts were applied at practically the same times. Field experiments with Bordeaux mixture and copper-lime dust were also made, and in both series of tests the sprayed plats outyielded the dusted ones. The freshly mixed copper sulfate and lime dust gave larger gains than any of the commercial preparations.

Very little late blight was found in any of the check plats early in September. It did not appear in any of the treated ones, and the data did not show the relative efficiency of the treatments for the control of blight. Hopper-burn was the only disease of any consequence in the plats, and the increases reported are considered as due to the control of this disease.

Some factors affecting the pathogenicity of *Actinomyces scabies*, G. B. SANFORD (*Phytopathology*, 16 (1926), No. 8, pp. 525-547, figs. 3).—A study was made of the effect of temperature, moisture, aeration, and substrate reaction on the germination, growth, and fructification of *A. scabies*, with particular reference to its pathogenicity.

The organism was found to grow within a wide range of temperatures, from 8 to 88° C., with an optimum of about 27°. It is said to be strongly aerobic, and it grows best in a soil moisture content that is most favorable for the potato plant. The limiting reaction for the germinating spores was about pH 5.3, and it is claimed that scab may be expected in soils with a reaction from strongly alkaline to a pH of about 5.4.

The effect of green rye plants applied to the soil as green manure was tested, and no indications were found that the use of green rye controlled potato scab by increasing the soil acidity.

Studies of pure strains of bacteria and *A. scabies*, which were found associated in cultures, showed that the bacteria produced more acidity when grown with *A. scabies* than when grown alone. Nearly all the bacterial strains used in the study are said to have made conditions more or less unfavorable for the growth of *A. scabies* on a potato-dextrose agar. When scab is controlled by green rye crops on some soils, it is suggested that the antibiotic qualities of

certain predominant soil microorganisms influence the development of *A. scabies*.

The relation of the seed-corn maggot (*Phorbia fusciceps*) to the spread and development of potato blackleg in Minnesota, J. G. LEACH (*Phytopathology*, 16 (1926), No. 3, pp. 149-176, pl. 1, figs. 13; abs. in *Phytopathology*, 16 (1926), No. 1, p. 68).—The relation between potato blackleg due to *Bacillus phytophthorus* and the seed-corn maggot *P. fusciceps* is pointed out, and a detailed account is given of investigations on which a preliminary announcement was made (E. S. R., 53, p. 545).

Outbreaks of potato blackleg in Minnesota were found that could not be associated with seed-piece transmission, and all attempts to produce the disease by inoculating seed pieces failed. The seed-corn maggot was observed in close association with the affected potatoes, and this led to a study of this relation whereby it was found that the seed-corn maggot is an agent of dissemination, inoculation, and hibernation of plant-pathogenic bacteria. The association between the bacteria and the insect appears to be one of mutualistic symbiosis, and constitutes a type of insect transmission of a bacterial plant disease not previously described.

The facts presented in this paper are thought to have a bearing on the problem of the origin of parasitism among dipterous insects.

The overwintering of *Phytophthora infestans*, H. L. G. DE BRUYN (*Phytopathology*, 16 (1926), No. 2, pp. 121-140, figs. 3).—From laboratory studies the author determined that *P. infestans* can live saprophytically on a considerable range of vegetable material, far better growth having been obtained on sterilized old brown parts of plants than on sterilized fresh plant parts. The behavior of the fungus at low temperatures and in varying moisture conditions was also studied. The oospores and resting bodies were found to withstand temperatures or from -20 to -26° C. for 5 days under laboratory conditions, the resistance being greater under dry than under moist conditions.

The author believes that there can be no objection to the theory that *P. infestans* can hibernate in the field. It is claimed that it can remain alive outside the potato plant and endure cold and drought. If it finds the right conditions in the spring, the fungus will renew its growth. The occurrence of overwintering in the field would seem to cast doubt on the success of careful inspection of seed potatoes to prevent epidemics of potato blight.

Transmission of potato spindle-tuber by cutting knives and seed piece contact, R. W. GOSS (*Phytopathology*, 16 (1926), No. 4, pp. 299-304, pl. 1; abs. in *Phytopathology*, 16 (1926), No. 1, pp. 68, 69).—The author reports that successful inoculations for spindle-tuber transmission were made in the greenhouse by rubbing together freshly cut surfaces of infected and healthy potatoes. Under field conditions, inoculations were also made by cutting healthy seed with a knife previously used to cut infected tubers. It is believed that cutting knives and seed piece contact can transmit spindle tuber, and they may be sources of infection in the field.

Freezing injury to potatoes, R. C. WRIGHT and H. C. DIEHL (*U. S. Dept. Agr., Tech. Bul.* 27 (1927), pp. 24, pls. 3, figs. 2).—A study was made of the effects of various storage temperatures upon the freezing points of potatoes and their susceptibility to freezing injury, the relation of undercooling to practical storage conditions, and the development of freezing injury as shown in various symptoms or types of necrosis in relation to the extent or duration of exposure to definite freezing temperatures. Three standard varieties of potatoes, Irish Cobbler, Green Mountain, and Triumph, were used in the investigations.

The average freezing point of potatoes of the standard commercial varieties was found to be about 29° F., but some variation was noticed for individual

tubers. The freezing point varied somewhat with the temperatures at which they had been stored. The average freezing points of potatoes of three varieties were found to be practically one degree lower when the tubers had been stored for several weeks at 32° than when stored at 50°. Potatoes from 32° storage showed less freezing injury than those from 50° after all had been exposed to the same freezing temperature.

It was found that under certain conditions potatoes could be undercooled to several degrees below their freezing points without freezing or other injury. Individual variations in the ability of potatoes to undercool when exposed to freezing temperatures is considered to account for the presence of certain frozen potatoes often found scattered among uninjured ones in storage.

Freezing injury was apparent in certain potatoes after half a minute of freezing, and the extent and character of the injury increased with the time of exposure after freezing commenced. Either net or ring type of necrosis occurred in the earlier stages of injury, and with a greater exposure a more pronounced ring type of necrosis blended into the blotch type. With extreme exposure the marked blackening of the vascular areas disappeared, and instead the tubers were distinguished by a characteristic cheese-like texture and chalky appearance. This stage preceded the leaker stage, in which the surface of tubers becomes wet on thawing out.

The relation of soil temperature and soil moisture to the development of head smut of sorghum, J. J. CHRISTENSEN (*Phytopathology*, 16 (1926), No. 5, pp. 353-357, fig. 1).—Studies were made, under controlled conditions, of the effect of soil moisture and temperature on the development of head smut of sorghum. Seedlings were found to become infected in dry soil at temperatures ranging from 16 to 36° C. In moist soil no infection occurred at 16°. The optimum soil temperature for infection was 28°. It is believed that the minimum, and probably the maximum, temperature requirement fluctuates with the percentage of moisture in the soil. High soil moisture content materially reduced the percentage of smutted plants at all temperatures and also narrowed the thermal range for infection. The results of this investigation are said to indicate that soil temperature and moisture during the period of germination and emergence of sorghum plants determined to a large extent the severity of the disease under field conditions.

Sugar cane diseases and pests [trans. title] (*Agricultura [Santiago de las Vegas]*, 1 (1925), No. 7, pp. 150-152).—Information regarding investigations in the Province of Camagüey, Cuba, ended in April, 1925, deals principally with the mosaic situation as regards areas, propagation, carriers, injury caused, and cane varieties.

The sugar cane mosaic situation [trans. title], S. C. BRUNER (*Agricultura [Santiago de las Vegas]*, 1 (1925), No. 7, pp. 160-162).—Information is given regarding sugar cane mosaic in Jamaica, the law relating thereto, and carriers and hosts. *Panicum barbinode* is named as an important factor in the propagation of mosaic.

Preliminary study of a new pyrenomycete parasite of sugar cane [trans. title], J. VIZIOLI (*Bol. Agr. [Sao Paulo]*, 27. ser., 1926, No. 1-3, pp. 60-69, pls. 3).—A descriptive account is given of a sugar cane disease, with a technical description of the associated organism, which is claimed to be a new species and is named *Myriogenospora* (?) *acculisporae*.

An improved method for isolation of *Thielavia basicola*, W. W. GILBERT (*Phytopathology*, 16 (1926), No. 8, p. 579).—Desiring to study pure cultures of *T. basicola* from tobacco roots, the author found that by sowing tobacco seed on blotters and inoculating with bits of infected tobacco roots a good growth

of the fungus was secured. Upon removal of the seedlings to carrot agar plates, pure cultures of the fungus were readily obtained.

Streak or winter blight of tomato in Quebec, T. C. VANTERPOOL (*Phytopathology*, 16 (1926), No. 5, pp. 311-331, figs. 3).—Field and greenhouse investigations are reported of the streak of tomatoes that are said to indicate that the cause of the disease is a filterable virus. A bacterial organism apparently identical with *Bacillus lathyri* was repeatedly isolated from streak lesions, but the author found no evidence to indicate other than secondary relations to the disease.

Data are presented to support the theory that the disease belongs to the virus type. Fertilizer treatments alone did not prevent the disease under all greenhouse conditions, and streak was not found to be transmitted through the seed. Transmission by aphids was shown. All attempts to induce the disease by changing environmental factors gave negative results. Excessive humidity, high temperature, and succulent growth are considered predisposing factors for this disease.

The author states that tobacco may serve as a carrier of streak, and a combination of potato mosaic and tomato mosaic viruses, when inoculated into the tomato, produced symptoms identical with those of true streak. The evidence is believed to indicate that these combined viruses are the true cause of the disease.

Verticillium wilt of tomatoes in California, B. A. RUDOLPH (*Phytopathology*, 16 (1926), No. 3, p. 234).—The occurrence in the San Francisco Bay region of California of a serious wilt of tomatoes caused by a species of *Verticillium* is reported. The organism, which is said to resemble *V. albo-atrum*, was found associated with wilted tomatoes in fields where as many as 90 per cent of the plants were destroyed.

The author states that the same fungus has been found to cause blackheart of stone fruits in California and the blue stem of raspberries.

Smut of western rye grass, W. P. FRASER and G. A. SCOTT (*Phytopathology*, 16 (1926), No. 7, pp. 473-477, figs. 2).—A smut of *Agropyron tenerum* is reported to be common in the prairie provinces of Canada. It is caused by a fungus closely resembling *Ustilago bromivora*. *A. richardsoni* and *A. dasystachyum* are also attacked.

Observations on infections of apple and prune roots by Armillaria mellea, S. M. ZELLER (*Phytopathology*, 16 (1926), No. 7, pp. 479-484, figs. 3).—Root rot, caused by *A. mellea*, is said to be a widespread and destructive orchard disease in the Northwest, especially in that portion of the coast States west of the Cascade Mountains. Infection is said to take place through wounds, at points of contact of diseased and healthy roots, and at point of emergence of lateral roots. When infection occurs at the point of contact of diseased and healthy roots, it is considered to start through healthy bark which has been acted upon by a toxic substance given off by tissues decayed by the fungus.

A core rot of apples, W. J. DOWSON (*Gard. Chron.*, 3. ser., 78 (1925), No. 2034, pp. 479, 480, fig. 1).—In July, 1925, an apple core rot was observed at Wisley, in association with *Sclerotinia fructigena*, which has not yet been proved to be exclusively causal in this connection.

Studies on leafhopper injury to apple leaves, A. A. GRANOVSKY (*Phytopathology*, 16 (1926), No. 6, pp. 413-422, pl. 1).—As a result of his investigations in Wisconsin, the author claims that the apple hopperburn symptoms are distinct from the ordinary feeding injury caused by leafhoppers. The typical leafhopper feeding injury is characterized by downward curling of the leaves, while apple hopperburn is characterized by a marginal yellow discoloration of

the leaves which moves progressively downward along the lateral veinlets and midrib. In cases of severe injury, the apical margins of the leaves turn brown and often curl upward.

Feeding experiments are said to indicate that the potato leafhopper, *Empoasca fabae*, is not only able to produce the symptoms, but that prolonged confinement of insects on apple leaves intensifies them. The symptoms of apple hopperburn are said to resemble hopperburn of potato strongly, suggesting the existence of some toxic or specific infective principle within the insect.

The definite association of certain species of leafhoppers with the symptoms, the progressive downward movement of symptoms in the vascular system, and the artificial production of symptoms with inocula prepared from the insects and affected leaves are said to indicate that the leafhoppers are carriers of some specific infective principle, possibly a virus.

A spot-rot of apples in storage caused by *Botrytis*, F. D. HEALD and R. SPRAGUE (*Phytopathology*, 16 (1926), No. 7, pp. 485-488, fig. 1).—A spot rot of apples occurring in storage is described, in which the decayed areas are said to have a pale, translucent, watery appearance which soon changes to a duller brown. The striking feature of the rot was the evident darker spots, which always centered around the lenticels. The *Botrytis* rot is reported to develop best at relatively high temperatures but without the spotting, which takes place at low temperatures. At higher temperatures the spots become indistinct blotches or fade out entirely. The development of the red coloration of the cultures is said to be peculiar to certain strains or isolations of the fungus.

Blossom blight of the peach, J. W. ROBERTS and J. C. DUNEGAN (*Phytopathology*, 16 (1926), No. 3, pp. 217-222).—Inoculation experiments carried on at Washington, D. C., and at Fort Valley, Ga., are said to show that the conidia and the ascospores of *Sclerotinia cinerea* are capable of causing a blossom blight of the peach. All parts of the open blossoms were found to be attacked, direct infections of the stigmas, anthers, petals, and inner surfaces of the sepals having been observed. It is believed that either ascospores or conidia, or both, may be responsible for outbreaks of blossom blight in peach orchards.

Relation of strawberry fruit rots to weather conditions in the field, D. H. ROSE (*Phytopathology*, 16 (1926), No. 3, pp. 229-232, fig. 1).—In a previous publication the author presented the results of studies of leather rot of strawberries caused by a fungus apparently identical with *Phytophthora cactorum* (E. S. R., 52, p. 150). Additional studies have indicated that the rot of strawberries in the field is dependent upon two factors, rainfall and temperature. If rains are followed by cool weather there is less danger of rot, but if followed by warm weather rot is likely to be serious.

Strawberry "yellows," a degeneration disease of the strawberry, A. G. PLAKIDAS (*Phytopathology*, 16 (1926), No. 6, pp. 423-426, fig. 1).—A disease of strawberries is described that is characterized by curling or cupping of the leaves, yellowing of the leaves around the margin and between the larger veins, dwarfing of the leaves, premature reddening or autumnal color of the older outer leaves, and the appearance of small red dots on the lobes of the margin of very young leaves, together with the transmission of the disease through runners.

Experiments by the author have shown that yellows is a virus disease, and that insects act as vectors. Strawberry plants infested with the strawberry aphid, *Myzus fragaeifolii*, as well as plants unprotected from insects, developed yellows within a month, as did three out of eight plants infested with red spider (*Tetranychus telarius*).

The distribution of cranberry false blossom, N. E. STEVENS and W. H. SAWYER, JR. (*Phytopathology*, 16 (1926), No. 3, pp. 223-227).—The authors report that false blossom of the cranberry has been found in Wisconsin on wild vines remote from cultivated bogs but not on wild vines in any other region. The distribution of this disease in New England and on the Pacific coast is believed to indicate that it was introduced into those regions by diseased vines brought from Wisconsin.

The most promising control method is believed to be the regular spring and fall flooding of the bogs, combined with good culture, together with the elimination of the most highly susceptible varieties.

Fusaria inoculation experiments.—Relationship of various species of *fusaria* to wilt and colorado disease of banana, O. A. REINKING (*Phytopathology*, 16 (1926), No. 6, pp. 371-392, figs. 8).—The results obtained by the author are said to show conclusively that *Fusarium cubense* is the only distinct species that can produce the banana wilt disease, and that this organism only is found in young, typical cases of infection. He believes that *F. cubense* is present in the soil, although no isolations were made. There is a possibility that a wild, saprophytic form of *F. cubense* is present in virgin soil, and that it may gradually adapt itself to the banana plant and eventually assume a distinct parasitic nature.

F. moniliforme subglutinans and *F. moniliforme erumpens* were quite generally associated with living and decaying plants, but they are considered to have no direct relation to the colorado disease, which is believed to be due to abnormal and poor cultural conditions.

Fruitlet black rot disease of pineapple, H. D. BARKER (*Phytopathology*, 16 (1926), No. 5, pp. 359-363, figs. 2).—A description is given of a fruitlet black rot disease of pineapples occurring in Haiti. Cultures made from tissues in the earliest stage of the disease are said to have yielded a pale yellowish bacterium, and inoculations with this organism produced typical symptoms of the disease.

Similarity of bacterial diseases of avocado, lilac, and citrus in California, C. O. SMITH (*Phytopathology*, 16 (1926), No. 3, pp. 235, 236).—Studies are briefly reported of a new bacterial blemish on the fruit of avocado and a bacterial disease of the lilac. Both of these diseases were apparently caused by *Pseudomonas citriputeale*, which causes black pit and blast of citrus fruits.

Little leaf disease of pecans, J. B. DEMAREE (*Phytopathology*, 16 (1926), No. 4, pp. 277-283, figs. 2).—A description is given of a disease of the leaves and twigs of pecan trees, for which the name little leaf is suggested. Affected leaves, as a rule, have a reduced number of leaflets which are oblong or rounded, often with obtuse or notched apices, and frequently are greatly reduced in size. Affected twigs are said to be slender, lacking in vitality, and the buds are small and blunt. Unsuccessful attempts were made to transmit the disease by budding and grafting. A badly affected tree transplanted to a location approximating field conditions entirely recovered. The cause of the disease is not definitely known.

A new parasitic myxomycete [trans. title], A. ANDREUCCI (*Arch. Bot.*, 2 (1926), No. 1, pp. 18-28).—*Plasmodiophora fic-repentis* n. sp. is described as found on *Ficus repens*.

A begonia immune to crown gall, with observations on other immune or semi-immune plants, E. F. SMITH and A. J. QUIRK (*Phytopathology*, 16 (1926), No. 8, pp. 491-508, figs. 5).—The authors report the occurrence of galls in a begonia plant that were suspected to be crown galls, but examinations showed that they were caused by nematodes (*Heterodera radiciicola*).

Inoculations with a virulent strain of *Bacterium tumefaciens* produced no galls. This led to an investigation of the immunity of the plant, and it ap-

peared that it was due to the acidity of the plant juice, which was decidedly greater than pH 5.7, the limit for the growth of *B. tumefaciens* in cultures. Other plants supposed or known to be immune were tested, and the juice of all was found to be more acid than the limit of tolerance of the crown gall organism. Further experiments showed that it was possible to produce crown galls on plants which were decidedly more acid in reaction than any organism tolerated in cultures, and this is believed to be due to mass action of the bacteria, a gall developing in any tissue after a tumor is once established. After being established the organism is believed to be able to change the medium to its necessities.

Fusarium rot of gladiolus corms, L. M. MASSEY (*Phytopathology*, 16 (1926), No. 8, pp. 509-523, pl. 1, figs. 3).—A description is given of a disease of gladiolus corms that is believed to be of general occurrence in New York State and present in other portions of the United States and Canada.

This *Fusarium* rot is considered to be an important disease. Corms become infected in the field, and the rot advances during storage. Diseased corms in storage may be reduced to worthless mummies under favorable conditions for the disease, and the planting of infected corms frequently results in the death of plants in the field. The cause of the disease is said to be due to *F. oxysporum gladioli* n. v., the morphological and cultural characters of which are described.

Control of hyacinth yellows [trans. title], VAN SLOOTEREN (*Weekbl. Bloembollencult.*, 37 (1926), No. 11, pp. 60-63).—Experiments for the control of hyacinth yellows by the use of heat dosage are briefly outlined, and the results are tabulated for bulbs having a circumference of from 6 to 14 cm.

Temperatures of 70 and of from 85 to 87° F. throughout the experiments appeared to have no protective effect. Temperatures from 85 to 87° throughout and from 98 to 100 or 118 and 119° during limited periods gave the best results as regards both freedom from the disease and growth of the treated bulbs.

The control of the narcissus eelworm, J. K. RAMSBOTTOM (*Gard. Chron.*, 3. ser., 77 (1925), Nos. 1988, pp. 76, 77; 1989, p. 96).—A review of outstanding work during seven years, looking to control of the narcissus nematode (*Tylenchus devastatrix*), deals with two general types of apparatus in use for the safe sterilization of narcissus bulbs, the favoring conditions, and the results, emphasizing the necessity for correct treatment before, during, and after sterilization.

A leaf blotch of the Shasta daisy, H. WORMALD (*Gard. Chron.*, 3. ser., 78 (1925), No. 2027, pp. 353, 354, fig. 1).—The author reports a leaf blotch of the Shasta daisy (*Chrysanthemum maximum*) in association with a fungus identified as *Septoria leucanthemi*, no previous record of which in Britain was found.

Sterilization of soil with steam [trans. title], E. VAN SLOOTEREN (*Weekbl. Bloembollencult.*, 37 (1926), Nos. 14, pp. 76-79, figs. 6; 15, pp. 85, 86).—Details are given regarding measures for the sterilization of soil for tulips against several diseases named. Apparently, about the best results are attained within the first hour of the soil treatment.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Zoological dictionary, E. HIRSCH-SCHWEIGER (*Zoologisches Wörterbuch. Berlin: Walter de Gruyter & Co., 1925, pp. VII+[I]+623, figs. 477*).—An illustrated dictionary of animal forms to which is appended an outline of the classification of animals.

Living creatures: Studies of animal and plant life, C. VON WYSS (*London: A. & C. Black, 1927, pp. XI+406, pl. 1, figs. 111*).—Included in this account are chapters on the life history and habits of insects of economic importance.

Food habits of Townsend's mole, *Scapanus townsendii* (Bachman), H. M. WIGHT (*Jour. Mammal.*, 9 (1928), No. 1, pp. 19-33).—In studies conducted in Oregon, the author found the food of this mole in its natural habitat to consist of earthworms, insect larvae and pupae, earthworm cocoons, centipedes, slugs, mature insects, and vegetable matter. The earthworm is the chief food in the diet of the mole, amounting to nearly three-fourths of the total eaten. With the exception of a few cases, vegetable matter had not been taken in quantities greater than is normally ingested in earthworms, and earthworm crops and gizzards were found to contain a sufficient amount of vegetable matter to explain the presence of the fibrous material most frequently found in the stomachs. However, eight animals out of 306 examined had eaten vegetable material the nature of which definitely illustrated that it was not taken incidental to the ingestion of earthworms.

Fed in captivity, moles showed a preference for animal rather than vegetable foods. Among the several meats fed, the order of preference was earthworms, ground beef, chicken, veal, liver, pork, and fish. Fish was found to be chosen only twice out of fourteen times when offered with beef, thereby demonstrating its inferiority as a bait.

Field mice inhabiting mole runways were on several occasions demonstrated to have injured potatoes. Field mice working in newly made mole runways removed sprouted peas from the furrows in which they were planted and carried them a distance of 20 ft., where they were cached in one pile. Of 70 old mole systems 50 per cent of those not reoccupied by other rodents or moles were found to be inhabited by field mice.

S. townsendii and *Scalopus aquaticus machrinoides* in captivity take water freely.

Preliminary report on a rat and flea survey of the city of San Juan, Porto Rico, A. L. CARRIÓN (*Porto Rico Rev. Pub. Health and Trop. Med.*, 3 (1927), No. 4, pp. 131-145, figs. 7).—The Norwegian rat was found to prevail in all sections of the city of San Juan. Fleas were found on 53.6 per cent of 360 live rats examined. A total of 2,575 fleas were collected, practically all of which were determined to be the oriental rat flea, although an occasional *Ctenocephalus* and a few sticktight fleas were encountered.

Red squill as a rat poison (*Jour. Min. Agr. [Gt. Brit.]*, 34 (1927), No. 7, pp. 597, 598).—Experiments recently conducted have led to the following general conclusions:

"(1) Female rats are killed by doses of red squill approximately only half as great as those generally needed to kill male rats. (2) The finer the red squill powder is ground the more toxic it becomes. (3) The best red squill baits for general use are those made from a finely ground and completely dried product of the bulb itself. (4) The average lethal dose for male and female rats is, approximately, 0.50 and 0.27 gm., respectively. (5) The white squill (used for medicinal purposes) is useless as a rat poison."

The poison is extracted from the red squill bulb (*Urginea maritima*), which grows on the sandy shores of the countries bordering the Mediterranean Sea, and may be used in powdered or liquid form.

Birds of Massachusetts and other New England States.—Part II, Land birds from bob-whites to grackles, E. H. FORBUSH ([Boston]: Mass. Dept. Agr., 1927 vol. 2 pp. L+461, pls. [45], figs. [49]).—This second part (E. S. R., 54, p. 655) of the author's work on Massachusetts birds deals with land birds from bobwhites to grackles. This volume also is illustrated with full-page colored plates from drawings by L. A. Fuertes.

Some remarks upon the insect food of the black-headed gull (*Larus ridibundus* L.), W. E. COLLINGE (*Ibis*, 12. ser., 3 (1927), No. 2, pp. 196-201).—In examinations of the stomach contents of 644 black-headed gulls, 317 were found to contain remains of injurious insects equal to 24.70 per cent of the total bulk of food consumed. In addition to these, there were 0.19 per cent of beneficial insects and 4.35 per cent of neutral insects, or a total insect content of 29.24 per cent. In all, 61 species of insects were identified.

Can birds hold injurious insects in check? E. H. STRICKLAND (*Sci. Mo.*, 26 (1928), No. 1, pp. 48-56).—The author here deals particularly with the general relationship between birds and plant-feeding insects. While birds that feed upon insects of foreign origin are of considerable value in the services they render in reducing the human effort that is necessary to keep their numbers in check, it is considered improbable that in the case of the vast majority of plant-feeding insects birds are a factor of much importance in reducing their population.

Agricultural parasitology: An introduction, C. L. WALTON and W. R. WRIGHT (*London: Sidgwick & Jackson*, 1927, pp. X+122, pls. 5, figs. 16).—This is a concise account of the parasites affecting livestock in Great Britain intended for use by students in classes in agricultural zoology.

Insect pest and disease control: Principles and methods in plant protection, W. TRAPPMANN (*Schädlingsbekämpfung: Grundlagen und Methoden im Pflanzenschutz*. Leipzig: S. Hirzel, 1927, pp. VIII+440, figs. 68).—A handbook in which an introductory account and a general discussion of insect pests and plant diseases are followed by accounts of the methods of combating them under the headings of cultural methods, biological methods, physical means, chemical means, and organized effort. A list of the more important insects and diseases is included.

On the effect of methods of mechanical control on the progress of introduced parasites of insect pests, W. R. THOMPSON (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 13-16).—This is a brief discussion of the relation of the various methods of mechanical control of insect pests to their permanent control by introduced parasites.

A tentative method for determining the relative injury of calcium arsenates to foliage, A. KELSALL and F. A. HERMAN (*Sci. Agr.*, 7 (1927), No. 6, pp. 207-209).—An account is first given of a few cases where the Official method of the Association of Official Agricultural Chemists for the determination of water-soluble arsenic in calcium arsenate failed to give satisfactory results. This is followed by a description of a method of analysis which has given satisfactory results with the materials under observation.

[**Proceedings of the seventh and eighth annual conferences, Western Plant Quarantine Board, 1925 and 1926**] (*Calif. Dept. Agr. Spec. Pubs.* 72 (1927), pp. 69; 73 (1927), pp. 103).—Among the papers presented at the seventh annual conference, held at Boise, Idaho, June 11-13, 1925, are the following: Methods Developed for Alfalfa Weevil Control in Idaho, by C. Wakeland (pp. 52, 53); Vacuum Fumigation, by D. B. Mackie (pp. 53, 54); The Oriental Fruit Moth, by A. C. Fleury (pp. 54-56); and Alfalfa Weevil Discussion (pp. 62-64).

Papers presented at the eighth conference, which was held at Olympia, Wash., June 9-11, 1926, include the following: The Work of the Division of Foreign Pests Suppression and the Destructive Insect Pest Act Advisory Board in Canada, by L. S. McLaine (pp. 45-49); Pest Control Problems on the West Coast of Mexico, by A. W. Morrill (pp. 70-82); and Quarantine Practices in the Republic of Mexico, by M. Alcazar (pp. 82-84).

Studies of insects, insect pests, and other animals (*South Carolina Sta. Rpt. 1927*, pp. 34-44, figs. 4).—Reference is first made to faunal and ecological studies. The abundance of the tomato fruit worm, officially known as the boll worm, was reduced in 1927 by the egg parasite and remedial treatments by more than 50 per cent.

A brief summary is given of work with the cotton flea hopper in continuation of results obtained in 1926 (E. S. R., 57, p. 163). The evening primrose, upon which fourth and fifth instars were found the last of April, is an important spring host. The croton, also an important host of the flea hopper, was from 1 to 3 in. tall by May 9, but the infestation of it was of little importance until the last of June. Adults were found on cotton as early as May 19, the first nymphal infestation of any importance being found on June 21. The pre-oviposition period was found to range from 3 to 8 days, with an average of 5.1 for the 10 individuals observed. The oviposition period ranged from 2 to 17 days, with an average of 8.5. The total life of the females ranged from 6 to 26 days, with an average of 15.8. The total number of eggs laid ranged from 5 to 42, with an average of 24.4. The incubation of 444 eggs observed from June 15 to September 15 ranged from 7 to 14 days, with an average of 9.37. Reference is made to the injury to cotton seedlings by the nymphs. Sulfur continued to be the most effective insecticide for the control of the pest.

A brief description and an illustration are given of the device used in studying the toxicity of hydrocyanic acid gas at low dilutions.

Studies of the Mexican bean beetle were continued and are briefly referred to. An average of 15.08 per cent of the adults placed in hibernation cages during the last part of their activities in 1926 emerged the following May and June. Their first activity was noted on March 21. The cage activities increased about April 18 and continued high until the emergence subsided in June. The highest emergence took place during the last third of May, when about one-half of the total emergence occurred. Its distribution extended southeastwardly by an average of about 80 miles, its annual extension into the State since 1921 being illustrated by a map.

The emergence of the codling moth, as shown by the examination of burlap bands, continued from March 28 to May 20.

Dominican Republic: Chief insects harmful to crops, G. Russo (*Internatl. Rev. Agr. [Rome], n. ser., 18 (1927), No. 7, pp. 880-882 (440T-442T)*).—Notes are given on the more important insect enemies of crops in the Dominican Republic.

Some insect pests of Sierra Leone, E. HARGREAVES (*West African Agr. Conf., Ibadan, Nigeria, Proc., 1 (1927), pp. 115-128*).—The insects of importance in Sierra Leone are here considered under the several crops affected.

Notes on the food-plants and habits of some Southern Nigerian insects, F. D. GOLDING (*Bul. Ent. Research, 18 (1927), No. 1, pp. 95-99*).—This is a tabulation of observations made in Southern Nigeria from 1922 to 1925.

Nigerian insect pests of cotton, F. D. GOLDING and O. B. LEAN (*West African Agr. Conf., Ibadan, Nigeria, Proc., 1 (1927), pp. 129-145*).—In this paper the authors give an outline of the entomological work that has been conducted on cotton pests during recent years by the Nigerian Agricultural Department, with the more important conclusions arrived at. The cotton stainers have been found the most important insect pests of cotton in the Southern Provinces of Nigeria and in the Ilorin Province.

Cotton growing in Queensland.—Part II, Pests of cotton in Queensland, E. BALLARD (*Queensland Agr. Jour., 28 (1927), No. 6, pp. 539-614, pls. 6*).—This part of a practical bulletin on cotton growing in Queensland deals with the more important insect pests of cotton occurring in that State.

Tobacco pests of Rhodesia, [I], II, R. W. JACK (*Rhodesia Agr. Jour.*, 24 (1927), No. 12, pp. 1235-1246, pls. 5; 25 (1928), No. 1, pp. 13-25, pls. 6).—This practical account of the more important insect enemies of tobacco in Rhodesia, particularly cutworms, stem borer (*Phthorimaea heliopa* Lwr.), potato tuber worm, and tobacco budworm (*Ohloridea obsoleta*), etc., is a revision of an article previously noted (E. S. R., 43, p. 52).

Pests of cocoa in the Gold Coast, G. S. COTTERELL (*West African Agr. Conf., Ibadan, Nigeria, Proc.*, 1 (1927), pp. 98-112).—This is an account by the Government entomologist of the more important insect enemies of cacao in the Gold Coast, with general control measures.

Guide to the insects of Connecticut.—Part V, The Odonata or dragonflies of Connecticut, P. GARMAN (*Conn. State Geol. and Nat. Hist. Survey Bul.* 39 (1927), pp. 331, pls. 22, figs. 67).—This fifth part (E. S. R., 50, p. 755) on the Odonata or dragonflies deals first with the biology and morphology (pp. 11-34), followed by the taxonomy (pp. 35-294) and a bibliography (pp. 295-297). A list of the species of Odonata treated in this paper is included.

The biology of the termite castes, T. E. SNYDER (*Quart. Rev. Biol.*, 1 (1926), No. 4, pp. 522-552, figs. 15).—This discussion includes a list of 60 references to the literature.

The American cockroach, an intermediate host of *Gigantorhynchus moniliformis* Brems. in Argentina [trans. title], J. BAGIGALUPO (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 29, p. 1251).—In an earlier account¹ the author has reported the discovery for the first time in Argentina of the parasitism of *Mus decumanus* by *G. moniliformis*. He has since discovered an intermediate host, having found 23 larvae of *G. moniliformis* in 3 of 38 specimens of the American cockroach collected in Buenos Aires.

The locust attack of 1926-27 in Sind, Kathiawar, and Gujarat, H. H. MANN and W. BURNS (*Agr. Jour. India*, 22 (1927), No. 5, pp. 325-332).—A report on a widespread and severe outbreak of the northwest locusts, their movement, feeding habits, list of the plants attacked, etc.

The sugar cane leaf-hopper, *Perkinsiella vastatrix* Breddin (Delphacidae, Homoptera), C. M. URBINO (*Philippine Agr.*, 16 (1927), No. 7, pp. 397-431, pls. 2, figs. 3).—This is a report of studies of the life history and bionomics of the sugar cane leafhopper (*P. vastatrix*), which is one of the relatively important pests of cane in the Philippine Islands. Details of the studies are presented in appended tables.

On some aphides infesting tulips, J. DAVIDSON (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 51-62, pl. 1, figs. 7).—This contribution from the Rothamsted Experiment Station relates to *Anuraphis tulipae* (De Fonsc.) *Rhopalosiphoninus tulipae* (Theo.), *Macrosiphum gei* (Koch), and the green peach aphid.

On the secretion of the silk substance in the silkworm (*Bombyx mori* L.), J. MACHIDA (*Jour. Col. Agr., Imp. Univ. Tokyo*, 9 (1927), No. 2, pp. 119-138, pl. 1).—A physiological study, in which material and methods are described, followed by a detailed report of observations and a list of 13 references to the literature.

Haitian cotton and the pink bollworm, G. N. WOLCOTT (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 79-82).—The author discusses the exceptional status of the pink bollworm in Haiti, where native cotton is largely resistant to its attack.

Learning to live with the European corn borer, W. P. FLINT, J. C. HACKLEMAN, F. C. BAUER, and I. P. BLAUSER (*Illinois Sta. Circ.* 321 (1928), pp. 15, pl. 1, figs. 11).—This is a revision of Circular 313 (E. S. R., 56, p. 556).

¹ *Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 24, p. 604.

Soil type influences European corn borer accumulation, C. R. NEISWANDER, G. W. CONREY, and L. L. HUBER (*Ohio Sta. Bimo. Bul.*, 13 (1928), No. 1, pp. 8-12).—An examination of 350 fields indicates that, other factors being equal, "the rate of development of the corn plant is largely dependent upon soil fertility, or the ability of the soil to produce good corn. Furthermore, it has been shown that the stage of development attained by the corn plant at the period of moth flight greatly influences subsequent infestation. The corn borer has, therefore, shown a tendency to accumulate most rapidly in areas which habitually produce good corn or where the soil is fertile."

The trend of European corn borer research, L. L. HUBER, D. J. CAFFREY, and C. R. NEISWANDER (*Ohio Sta. Bimo. Bul.*, 13 (1928), No. 1, pp. 3-8).—This is a brief review of the progress of research work as applicable to the control of the European corn borer.

Airplane dusting to control the hemlock spanworm, S. B. FRACKER and A. A. GRANOVSKY (*Jour. Forestry*, 26 (1928), No. 1, pp. 12-33, fig. 1).—This is a detailed report of control work with *Ellopiia fuscicollaria* Guen., collected by the authors in Wisconsin, accounts of which have been previously noted from other sources (*E. S. R.*, 56, p. 755; 57, p. 857).

Sky dusting the hemlocks, S. B. FRACKER and A. A. GRANOVSKY (*Amer. Forests and Forest Life*, 33 (1927), No. 406, pp. 587, 588, 640, figs. 2).—This is a popular account of control work with the hemlock spanworm (*Ellopiia fuscicollaria*), a report of investigations on which is noted above.

Studies on the bionomics of North American anophelines.—**Winter activities of anophelines in coastal North Carolina (36° N. Lat.)**, M. C. BALFOUR (*Amer. Jour. Hyg.*, 8 (1928), No. 1, pp. 68-76, figs. 2).—A report of studies made in the coastal area of northeastern North Carolina, where *Anopheles quadrimaculatus*, *A. punctipennis*, and *A. crucians* are the species met with.

It was found that in this area *A. quadrimaculatus* and *A. punctipennis* pass the winter in both larval and adult stages, while *A. crucians* passes it in the larval and probably the adult stages. The adult females of *A. quadrimaculatus* and *A. punctipennis* appear to be the more important factor in carrying the species from fall to spring. Larvae will survive a 10-day period, having a mean minimum temperature of 24° F. and an absolute minimum of 12.5°. An adverse period of several days during which there was 3 in. of ice on all breeding places and another interval of 20 in. of snow were successfully resisted. Egg laying by wintering females took place in a warm interval in the middle of February. The first brood or emergences from wintering larvae probably occurred late in February, but the numbers were undoubtedly small. The second brood, resulting from oviposition by wintering females and from oviposition by the imagines of the first brood, emerged the latter part of April. The first male was captured April 14. Adults were caught most frequently in stables.

Hatching stimuli for eggs of the yellow fever mosquito [trans. title], E. ROUBAUD (*Compt. Rend. Acad. Sci. [Paris]*, 184 (1927), No. 24, pp. 1491, 1492; *abs. in Rev. Appl. Ent.*, 15 (1927), Ser. B, No. 9, p. 161).—It was found that some eggs of this mosquito contain active larvae that normally emerge in 3 or 4 days even in sterile water, while others contain inactive larvae that may live for months in the eggs, resistant to drying, and floatage on or submerged in pure water. Such eggs hatch under the stimulus of microbic enzymes in the water. It is pointed out that certain physical agents such as variations in temperature, rehydration, etc., or chemicals such as sulfuric ether, permanganate of potash, oxygenized water, etc., can also induce hatch-

ing of the eggs, but that the results are mediocre and inconstant. In contrast, hypochlorite of soda in weak solutions acts as a hatching stimulus that is comparable with that normally exercised by the microbic enzymes in water. Eggs kept in water 3 months without hatching hatched in less than 24 hours when placed in a 1:1,000 solution of Javelle water (a commercial solution of sodium hypochlorite) and in 1 to 6 days in a 1:10,000 solution, resulting in the destruction of the larvae.

A case of the botfly (*Bogeria buccata*) as a parasite upon the common house mouse (*Mus musculus*) (Dipt.: Oestridae), D. F. MILLER (*Ent. News*, 39 (1928), No. 1, pp. 13-15).—The author records observation of parasitism of the mouse *M. musculus* by the botfly *B. buccata* at Mahtua, Ohio.

Breeding the tachinid parasite, E. JARVIS (*Sugar* [New York], 29 (1927), No. 12, pp. 562-565, figs. 7).—This is a practical account of the work conducted in Queensland, Australia, with the tachinid parasite (*Ceromasia sphenophori*) of the weevil borer of sugar cane.

Notes on the breeding of certain fruit flies in captivity, H. JARVIS (*Queensland Agr. Jour.*, 28 (1927), No. 5, pp. 451, 452).—These notes relate to the rearing of the Queensland fruit fly (*Chaetodacus tryoni* Frogg.) and the Jarvis fruit fly (*C. jarvisi* Tryon).

International instructions regarding the application of the method of artificial control of the olive fly (*Internatl. Rev. Agr.* [Rome], n. ser., 18 (1927), No. 5, pp. 603-607 (307T-311T)).—This is a compilation of instructions regarding artificial control of the olive fruit fly, made by A. Berlese at the request of the International Commission for Plant Protection, which is a part of the International Scientific Council of the International Institute of Agriculture.

The Dickey rice weevil (*Maleuterpes* (*Prosayleus*) *phytolymus*) Olliff., A. R. WOODHILL and S. L. ALLMAN (*Agr. Gaz. N. S. Wales*, 38 (1927), No. 10, pp. 791-799, figs. 3).—A brief account of a pest the adults of which are the cause of serious losses by feeding on the skin of young fruit of citrus, commencing to feed as soon as the fruit sets. The larvae feed on the roots of the trees. Control work has shown that the damage can be effectually prevented by banding the trunks of the trees with a suitable sticky material (so that the weevils can not obtain access to the fruit and foliage by crawling up the trunk), if accompanied by jarring the branches, clean culture, etc.

[Boll weevil studies in South Carolina] (*South Carolina Sta. Rpt.* 1927, pp. 7, 8, 83, 84, 92).—Brief reference is made to the status of hibernation studies, it being stated that practically all weevils placed in hibernation during September died during the winter. There was an increase in the percentage of survival of weevils placed in hibernation after October 10, 9 per cent of the 14,000 weevils so placed between October 10 and 30 having survived during the winter of 1926-27. It was found that natural emergence from cages in the woods and infestation of plants in the field by overwintered weevils continued well into July. In the field at six different points near Florence there was a much larger weevil infestation early in the season than had been experienced for several years. The general migration of weevils from field to field began much earlier in 1927 than in the preceding year. From August 10, when the migration commenced, the movement increased rapidly until its peak was reached about August 30.

Control measures, including the application of calcium arsenate dust, at the Pee Dee Substation increased the yield of cotton by tenfold. Reference is also made to work at the Coast Substation conducted in cooperation with the Chemical Warfare Service, U. S. War Department.

A chart-recording weighing machine for beekeeping or other research, C. B. WILLIAMS (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 63-65, pl. 1, fig. 1).—Descriptions and illustrations are given of a machine used by the author in Egypt.

Injuries to vegetation by mound-building ants, E. A. ANDREWS (*Amer. Nat.*, 62 (1928), No. 678, pp. 63-75).—This account relates to the direct attack of *Formica exsectoides* upon plants. The author concludes that it kills many trees in Maryland and States to the north, the damage being done chiefly in plantations of young trees or in clearings that are naturally growing with weeds and trees.

The parasitic Hymenoptera of economic importance noted from south India, T. V. RAMAKRISHNA AYYAR (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 73-78).—This list is in continuation of that previously noted (*E. S. R.*, 47, p. 358).

Descriptions of three species of Prospaltella and one of Encarsia (Hym. Chalcidoidea) parasitic on Aleurocanthus (Aleyrodidae) [trans. title], F. SILVESTRI (*Eos [Madrid]*, 2 (1926), No. 2-3, pp. 179-189, figs. 4).—The species here described as new are *P. smithi* from *A. spiniferus* Q. & B. in China and the citrus blackfly in Ceylon; *P. divergens* from the citrus blackfly in Singapore; *P. shii* from *A. spiniferus* in China; and *E. merceti* from the citrus blackfly in Singapore, all on citrus. The variety *E. merceti modesta* from *A. spiniferus* on citrus in Singapore and the Philippine Islands is described as a new variety.

A new species of parasitic Hymenoptera (Chalcidoidea, Eupelmidae), R. L. TAYLOR (*Bul. Brooklyn Ent. Soc.*, 22 (1927), No. 4, pp. 205-207, fig. 1).—Under the name *Eupelmus pini* the author describes a new species reared from cocoons in the larval chambers of the white-pine weevil at Roslindale, Mass.

Eight new species of Braconidae, D. S. WILKINSON (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 33-46, figs. 12).—The new species here described include *Microbracon kirkpatricki*, which parasitizes the pink bollworm in Kenya Colony and Tanganyika Territory; *Rhaconotus scirpophagae*, which is parasitic on the pyralid moth *Scirpophaga auriflua* in sugar cane in Pusa; *R. sudanensis*, reared from cotton stems containing buprestid beetles (*Sphenoptera gossypii*) in Anglo-Egyptian Sudan; *Opius agreutretae*, reared from pupae of a trypetid fly, *Agreutreta discoidalis*, in South Africa; *O. phaeostigma*, reared from a dipterous, probably trypetid, pupa in Natal; *O. cosyrae*, parasitic on a trypetid, *Ceratitis (Pardalapsis) cosyra*, in Tanganyika Territory; *Meteorus margaroniae*, reared from the larvae of a pyralid moth, *Margaronia dimorpha*, in South Africa; and *Meteorus komensis* in Uganda.

Notes on a braconid parasite of the pink boll-worm (*Platyedra gossypiella* Saund.) in Kenya Colony, T. W. KIRKPATRICK (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 47-50).—These notes relate to *Microbracon kirkpatricki* Wilk., above described, which parasitizes the pink bollworm on the coast of Kenya Colony.

Insect flagellates and disease—a study in adaptation, C. M. WENTON (*Nature [London]*, 120 (1927), No. 3030, p. 786).—It is pointed out that pathogenic flagellates parasitic in insect hosts, in the intestines of which most of them occur, may adapt themselves to life in other hosts.

Two species of *Giardia* from the rat, L. A. POTTER (*Amer. Jour. Hyg.*, 8 (1928), No. 1, pp. 77-84, figs. 4).—This is a report of studies of two species of *Giardia* in the rat, one of which is thought to be *G. muris* and the other *G. lamblia*. As a result of these studies and the results reported by other workers, it is thought that the rat may, at times, harbor *G. lamblia* and, therefore, act as a reservoir for this parasite of man.

On the development of *Fasciola hepatica* [trans. title], G. BUGGE (*Deut. Tierärztl. Wochschr.*, 35 (1927), Nos. 36, pp. 575-581, figs. 7; 37, pp. 594-596).—This is an account of studies of the liver fluke, reported in connection with a list of 19 references to the literature.

ANIMAL PRODUCTION

Animal ecology, C. ELTON (*London: Sidgwick & Jackson, 1927, pp. XX+207, pls. 8, figs. 13*).—A treatise divided into the following chapters: The distribution of animal communities, ecological succession, environmental factors, the animal community, parasites, time and animal communities, the numbers of animals, variations in the numbers of animals, dispersal, ecological methods, and ecology and evolution.

Scientific slaughtering, C. W. HUME (*Nature [London]*, 119 (1927), No. 2996, pp. 481-483).—Experiments were conducted by the Corporation of London, England, on the problem of humane slaughtering of animals for food. Under the present system of killing it was found with experienced slaughtermen that it took on the average 2.49 blows with the poleax to stun a bull, 1.23 blows to stun a steer, 1.27 to stun a cow, and 1.55 to stun a large sow or boar. On the other hand, with a particular captive-bolt pistol 542 cattle were stunned with 543 shots and 712 swine stunned with 715 shots. With the Kosher method of killing, the duration of consciousness, as tested by corneal reflex and purposiveness of movement, varied from 5 to 40 seconds, averaging about 20. An examination of the meninges showed that when animals were stunned before killing this tissue was normal, whereas when killed without stunning it was intensely congested, showing that suffering had occurred. After stunning with the captive-bolt pistol the animals were bled immediately, and investigations failed to prove the contention that the flesh of shot pigs is apt to be disfigured by "blood splash." The use of the particular pistol recommended does not involve danger to the operator or to bystanders.

Steer feeding [at the South Carolina Station] (*South Carolina Sta. Rpt. 1927, pp. 56, 57*).—Four lots of steers were fed the following rations: Cottonseed meal and hulls, cottonseed hulls and soy bean meal, cottonseed meal and corn silage, and soy bean meal and corn silage. The average daily gain per steer in the respective lots was 1.4, 1.47, 1.77, and 1.7 lbs. The feed required per 100 lbs. of gain was approximately 2,268, 2,148, 2,784, and 2,790 lbs. in the respective lots. Preliminary reports on the slaughter data showed little correlation between the rapidity of gain and the tenderness of the meat. The lots receiving silage averaged higher in tenderness and palatability than the other lots.

The sheep as a grazing animal and as an instrument for estimating the productivity of pastures, R. G. STAPLEDON and M. G. JONES (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 5 (1925-1926), pp. 43-54*).—The authors discuss a new technique for arriving at the yield per acre of grazeable plants and for estimating the amount of these eaten by sheep. In this test of a grass mixture composed of perennial ryegrass, cocksfoot, and red clover, 12.66 tons of green material, excluding the extraneous moisture, was yielded per acre. Sheep consumed per day from 9.8 to 24.2 lbs. of green grass when extraneous moisture was counted and from 2.6 to 3.4 lbs. on a dry-matter basis. Observations made on sheep while on pasture showed that about half the time is spent in grazing and chewing the cud and the other half in resting. The early morning and late evening were preferred for grazing. Unfavorable conditions during the day caused more cud chewing at night. During periods of rain the sheep ceased to graze.

Italian rye-grass for winter and early spring keep: The effect of methods of grazing on productivity and palatability and on the chemical and botanical composition of the herbage, R. G. STAPLEDON, T. W. FAGAN, R. E. EVANS, and W. E. J. MILTON (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 5 (1925-1926), pp. 5-41, figs. 4*).—Studies were made at the University College of Wales on the problem of providing grazing for sheep during the winter months and especially during the early spring when ewes are nursing their lambs. Four main plats divided into duplicate subplats were used in the test. The "a" series of subplats were seeded with a mixture of 8 lbs. of Italian ryegrass, 4 lbs. of rape, and 1.5 lbs. of hardy green turnips; the "b" series with 10 lbs. of Italian ryegrass and 10 lbs. of tall fescue. Aside from the difference in seeding the treatment for subplats was identical. The first main plat was sampled on September 21, grazed hard for a few days by sheep, and allowed to rest until March 29. Plat 2 was sampled at the same time and at each subsequent month to March 29, and after each sampling was grazed by sheep. Plat 3 was allowed to remain idle. Plat 4 was sampled on October 27 and December 30, grazed after each sampling, and then rested to March 29.

Italian ryegrass, when cut monthly during the winter, gave a higher yield than when cut once, twice, or even three times. Grazing off the annual growth in the fall and then resting until March 30 gave the greatest yield of nutrients, but was a wasteful practice, since good grazing could be obtained from this plat throughout the winter. Large amounts of dry matter were obtained from the ungrazed and the separately grazed plats, but this dry matter was of poor quality and prevented in a measure the growth of new grass. Chemical analysis of Italian ryegrass showed that the leaf has nearly twice as much protein as the stem and is also higher in silica-free ash and lime. The leaves in the plats grazed monthly and in October and December contained more protein than those ungrazed or grazed in September. Italian ryegrass contributed practically all of the yield in this work after the first two cuttings.

The nutritive value of dried spent hops, W. L. DAVIES and R. S. SULLIVAN (*Jour. Agr. Sci. [England], 17 (1927), No. 3, pp. 380-387*).—The digestibility of dried spent hops was determined at the University of Reading, England, with three crossbred yearling wethers. During a 12-day digestion period each wether received a ration of 500 gm. of meadow hay chaff, 120 gm. of linseed oil meal, and 100 gm. of hops per day. This was followed after an interval by a second 12-day digestion period when the ration was the same as above, except that the hops were omitted.

It was found that dried spent hops had a low digestibility, 20 per cent of the crude protein and nitrogen-free extract, 50 per cent of the ether extract, 5 per cent of the crude fiber, and 20 per cent of the total organic matter being digestible. It had a starch equivalent of 24.5. This feed has a high crude protein (21.51 per cent) and ether extract (8.33 per cent) content for a feed with such a high fiber content (25.03 per cent). Spent hops are not palatable, and when included in the ration had a depressing effect upon the digestibility of the minerals of the basal ration. The product has a high absorptive capacity, and is sometimes used as a filler to absorb such products as molasses.

[Feeding experiments with swine at the South Carolina Station] (*South Carolina Sta. Rpt. 1927, pp. 53-56, figs. 2*).—The results of some experiments, several of which have been previously noted (*E. S. R., 56, p. 565*) are briefly reported.

Protein supplements to corn for fattening hogs in dry lot.—Six lots of 10 pigs each, averaging 51 lbs. in weight, were fed in dry lot on a basal ration of shelled corn. Three lots received tankage and 3 others fish meal, to which was

added in different lots in the series soy bean and peanut meal. The fish meal series proved more efficient than the tankage series in rate and economy of gain. Wheat bran added to the fish meal and soy bean ration did not increase the rate of gain, but did increase the feed required per unit of gain. Fat tests showed a higher percentage of hard hogs in lots receiving fish meal.

Home mixtures for fattening pigs in dry lot.—Pigs receiving a mixture of corn, soy bean meal, and fish meal made an average daily gain of 1.79 lbs. and required 358.12 lbs. of feed for each 100 lbs. of gain.

Protein supplements for breeding pigs on forage.—A ration composed of corn meal, red dog flour, wheat bran, and fish meal proved superior in rate of gain, in growth, and in condition of pigs, but required more feed per unit of gain than either a combination of shelled corn, soy bean meal, and fish meal or this latter ration plus wheat bran for pigs on forage.

A comparison of supplements to standing corn for fattening hogs: The quality of pork produced.—Tests at the Pee Dee Substation showed that pigs fed standing corn and tankage made an average daily gain of 2.06 lbs. in comparison with standing corn and soy beans grown together, which produced an average daily gain of 1.7 lbs. The cost per 100 lbs. of gain was slightly higher in the tankage lot. With one exception all pigs in both lots killed hard.

A comparison of forage crops for hogs.—In a study of the economy of gains on forage crops, it was found that when a 2.5 per cent corn and tankage ration was used soy bean forage produced the most economical gains. Soy beans plus a 2.5 per cent corn ration was next in economy, followed by alfalfa plus a 2.5 per cent corn and tankage ration. Pigs in dry lot fed corn and tankage made the most rapid gains but also the most expensive gains.

American wild horses, J. W. GIDLEY (Sci. Mo., 25 (1927), No. 3, pp. 265-271, figs. 7).—The author discusses the history of the wild horse in America as determined from fossil remains found in all parts of the United States, Mexico, and Central and South America, and some even as far north as the Arctic Circle.

Feeding chickens, M. A. JULL and A. R. LEE (U. S. Dept. Agr., Farmers' Bul. 1541 (1927), pp. 11+24, figs. 9).—This supersedes Farmers' Bulletin 1067, previously noted (E. S. R., 41, p. 869).

Feeding legume hay to chickens, D. C. KENNARD and G. LINGLE (Ohio Sta. Bimo. Bul., 13 (1928), No. 1, pp. 24-26, figs. 3).—Descriptions and measurements of feeders for chopped legume hay that have been found successful at the station are given.

Oats for the layers, D. C. KENNARD and L. B. NETTLETON (Ohio Sta. Bimo. Bul., 13 (1928), No. 1, pp. 26, 27).—Preliminary work on feeding oats to laying hens suggests that mixing whole oats at the rate of 10 to 20 per cent by weight in the mash is as desirable as grinding. Only high quality heavy oats should be used as a poultry feed, and this quality can be best determined when the oats are fed whole.

Further experiments in feeding thyroid to fowls, L. J. COLE and F. B. HURT (Poultry Sci., 7 (1928), No. 2, pp. 60-66).—Continuing the study of thyroid feeding at the Wisconsin Experiment Station (E. S. R., 52, p. 675), 40 White Leghorn hens were divided into two groups and housed under identical conditions. Both lots received the same basal ration, but one group received in addition for the 6 weeks' test desiccated thyroid at the rate of 59 mg. per pound of live weight, fed in gelatin capsules. Thyroid feeding brought on a sudden molt with several hens at various stages of feeding, in contrast to the controls which molted slowly. In the amounts fed thyroid had no effect upon body weight, and there was no evidence that egg production was influenced by the feed.

In another test raw and desiccated thyroids were fed to hens and cocks of different breeds to observe the effect upon the color and structure of the plumage. The rate of feeding was based on the assumption that 1 gm. of desiccated thyroid was equivalent to 5 gm. of fresh normal thyroid. The group getting raw thyroid received 0.42 gm. daily, and those getting desiccated thyroid received 84 mg. daily. Small areas on the neck, wing bow, and saddle of each bird were plucked free of feathers and samples of these saved for comparison. Both raw and desiccated thyroid induced hen feathering in all males but the Sebright, a breed in which the male is normally hen feathered. In the dimorphically colored breeds the color pattern changed from male to female as a result of thyroid feeding. Raw thyroid in the amounts fed had less stimulating effect upon feather growth than the desiccated thyroid, while the latter hastened the normal molt of hens. No appreciable evidence was noted of lack of pigmentation in the new feathers grown in this test, nor was any appreciable effect noted on body weight or egg production.

Yeast in poultry nutrition.—I, The value of yeast and semi-solid buttermilk in promoting the growth of chickens, J. E. DOUGHEERTY (*Poultry Sci.*, 7 (1928), No. 2, pp. 72-78).—At the California Experiment Station 679 chicks, 4 weeks of age, were divided into 7 lots on the basis of size and vigor. Each lot received the same scratch-grain mixture, green feed, and a mash, fed as follows: Lot 1 dry, lot 2 dry plus 5 per cent of yeast, lot 3 moist plus 5 per cent of yeast, lot 4 moist, lot 5 fermented with 5 per cent of yeast and fed moist, lot 6 fermented and fed moist, and lot 7 dry plus semisolid buttermilk paste fed separately. The mash was fed at noon, and the chicks were allowed all they would clean up in an hour. The buttermilk was fed 1 hour before the mash, and the chicks were allowed all they would eat in one-half hour.

The percentage gained in 90 days over the initial weight was 503, 590, 520, 378, 516, 309, and 688 per cent, respectively. The cost of feed per chick was highest in lot 2 and lowest in lot 6. Dry granulated yeast and semisolid buttermilk added to the mash stimulated appetites and increased materially the rate of gain. No advantage was effected by feeding yeast mash moistened or fermented. The cost of yeast and semisolid buttermilk is the determining factor governing their use in the feeding of chicks.

Rearing chicks in confinement, T. B. CHARLES and H. C. KNANDEL (*Pennsylvania Sta. Bul.* 218 (1928), pp. 12, figs. 4).—Of 4,289 chicks raised from hatching to maturity in screened brooder houses with screened sun porches, there was a loss of but 10.2 per cent. Good growth was obtained, and the birds had a deep yellow pigmentation throughout the test. Single Comb White Leghorns on an all-mash ration attained a weight of 2.39 lbs. at 16 weeks. Barred Plymouth Rock cockerels weighed 1.87 lbs. at 10 weeks of age. The cause, symptoms, and control of coccidiosis are discussed. Rations are suggested, and the advantages of this system of rearing chicks with reference to the control of coccidiosis are pointed out.

The effect on bone formation of winter sunlight transmitted by a glass substitute, W. C. RUSSELL and O. N. MASSENGALE (*Poultry Sci.*, 7 (1928), No. 2, pp. 85-91, figs. 3).—Four lots of 95 5-day-old White Leghorn chicks each were fed at the New Jersey Experiment Stations on the Wisconsin ration of Hart et al., previously noted (*E. S. R.*, 52, p. 573), which was kept before the birds at all times. In lot 1 the chicks were placed in a specially constructed house with a curved surface covered with a glass substitute. Lots 2, 3, and 4 were housed in a basement laboratory. Lot 2 was exposed at a distance of 36 in. for 15 minutes daily to the rays of a quartz mercury lamp, lot 3 was exposed for 20 minutes daily, and lot 4 received no treatment. The chicks

were weighed individually each week, and 4 were selected from the middle group based on weight and 2 each from the heavier and lighter groups. Ash determinations were made on the femur and large wing bone of each of these chicks.

It was found that winter sunlight was effective in preventing leg weakness in chicks when filtered through the glass substitute. Exposure to ultra-violet light was also effective, but these data suggest that winter sunlight radiated through the glass substitute was more effective than the quartz mercury lamp.

DAIRY FARMING—DAIRYING

Experiments with dairy cattle [at the South Carolina Station] (*South Carolina Sta. Rpt. 1927, pp. 57-60, fig. 1*).—The results of several experiments are noted.

Corn v. sorghum silage for milk production.—Continuing this study (E. S. R., 52, p. 577), it was found that on the basis of total digestible nutrients consumed sorghum silage was 76.9 per cent as efficient as corn silage for milk production and 79.28 per cent as efficient for butterfat production. On the basis of cost of ration, sorghum silage was 75 per cent as efficient as corn silage. On an acre basis it was 90 per cent as economical as corn silage.

The utilization of corn and sorghum grains in silage.—A five-day test with 4 cows showed that 1.86 per cent by weight of the corn grain and 26.27 per cent of the sorghum grain in silage passed through the digestive tract of cows unchanged.

The value of grinding hay for dairy cattle.—In continuing this study (E. S. R., 56, p. 568) long and ground soy bean hay was fed to two groups of cows for 120 days. While good quality hay was used, those receiving long hay refused 23.39 per cent of the amount offered as compared to a 10 per cent refusal in the case of ground hay. There was little difference in the quantity or quality of milk produced on the two rations. Somewhat more hay and slightly less silage and grain were required to produce 100 lbs. of milk when ground hay was fed.

That grinding did not increase the digestibility of soy bean hay was determined in digestion trials with four cows. In every case except with ash the coefficient of digestibility for the long hay was equal to or greater than that of ground hay.

Hay for dairy cattle, C. C. HAYDEN (*Ohio Sta. Bimo. Bul., 13 (1928), No. 1, pp. 12-14*).—The author describes the U. S. grades of alfalfa hay that are best suited for dairy cattle.

Methods of milk conservation, especially pasteurization and sterilization of milk, H. WEIGMANN, trans. by J. WILLMANN (*Derby, Conn.: J. W. Willmann, 1927, pp. 103, pl. 1, figs. 24*).—A short treatise, translated from the German original, which explains the processes and machinery used in the pasteurization of milk as worked out in Germany step by step up to 1892. The translator has brought the subject up to date by showing the development of modern pasteurizers. Among the topics discussed are the origin and effects of bacteria in milk, methods of conserving milk, and milk as a food for infants.

New pasteurization method (*N. Y. Prod. Rev. and Amer. Creamery, 64 (1927), No. 23, p. 787*).—It is reported that Dr. [H.] Stassano, of the Pasteur Institute, Paris, has invented a new method of pasteurizing milk and cream that is quite efficient. Under this new system the milk and cream is pumped through a system of tubes 1 mm. thick where it is pasteurized at a temperature below 75° C. Pasteurization is completed in about 10 seconds. It is claimed

that the milk retains all of its original characteristics and is more completely sterilized than by the old method. There is no pasteurized taste to the milk, and cream rises as in raw milk. No losses occur due to evaporation, and it is as suitable for cheese making as raw milk. When cooled to 20° after pasteurizing it will keep as well as though cooled to 3°.

Sixteenth annual report of the International Association of Dairy and Milk Inspectors, compiled by I. C. WEID (*Internat. Assoc. Dairy and Milk Insp. Ann. Rpt.*, 16 (1927), pp. 328+8, pl. 1, figs. 11).—The usual report of the annual meeting (E. S. R., 57, p. 371) held at Toronto, Ont., Can., October 24–26, 1927, includes the following papers:

Presidential Address, by W. A. Shoults (pp. 29–42); Some Economic Factors in the Distribution of Milk in Ontario Cities, by J. B. Hoodless (pp. 43–50); The Revised New York State Milk Code, by P. B. Brooks (pp. 51–58); Record Forms for Use in the Supervision of Milk Supplies, by I. V. Hiscock (pp. 59–65); The Place and Purpose of Certified Milk, by J. W. Vanderslice (pp. 66–72); Report of Committee on Communicable Diseases Affecting Man—Their Relation to the Milk Supply and to the Public Health, by H. N. Parker (pp. 73–79); Report of Committee on Bovine Diseases: Their Relation to the Milk Supply and to the Public Health, by C. D. Pearce (pp. 80–85); The Massachusetts Milk Inspectors' Association: Its History and Achievements, by R. I. Prentiss (pp. 86–89); A Year's Work on Positive Pasteurization, by A. R. Toiland (pp. 90–100); What Are the Sources of High Bacterial Counts in Pasteurized Milk? by H. A. Harding and A. R. Ward (pp. 101–110); Use of Blood Agar in Control of Milk Supplies, by S. C. Prescott and M. E. Parker (pp. 111–122); Report of Committee on Food Value of Milk and Milk Products, by I. V. Hiscock (pp. 123–132); Address, by C. J. Hastings (pp. 133, 134); The Catalase Test in Milk Control (pp. 135–149) and The Quantitative Limitations of the Reductase Test (pp. 150–153), both by J. H. Shrader and F. A. Korff; Further Studies on the Relation of Biochemical Constituents of Media to Bacteria Counts, by J. H. Shrader, F. A. Korff, and C. L. Ewing (pp. 154–162); Report of Committee on Educational Aspects of Dairy and Milk Inspection, by C. L. Roadhouse (pp. 163–177); *Bact. abortus* Infection in Man and Its Relation to Milk Consumption, by J. G. McAlpine and C. A. Slanetz (pp. 178–183); The Practical Sanitary and Economic Advantages of Concentrated Milk, by J. A. Tobey (pp. 184–191); Milk Pasteurization in Illinois, by P. F. Krueger (pp. 192–199); Report of Committee on Score Cards and the Score-card System of Rating Dairies and Dairy Products, by C. S. Leete (pp. 200–204); New Haven's Milk Bottle Exchange, by J. L. Rice and C. H. Amerman (pp. 205–208); Is Dairy Inspection an Exact Science? by E. Kelly (pp. 209–213); Education Is Surer Than Legislation, by W. G. Hollingworth (pp. 214–218); The Physician's Duty in Teaching the Public the Value of Milk, by R. F. Lockwood (pp. 219, 220); Chemical and Bacteriological Quality of Some Commercial Milk Powders, by J. H. Shrader (pp. 221–226); Report of Committee on Dairy and Milk Plant Equipment, by G. W. Putnam (pp. 227–233); Report of Committee on Milk Plant Practice, by H. A. Harding (pp. 234–245); Use of the Direct Microscopic Count in Quality Control, by M. W. Yale (pp. 246–256); The Relation of the Hydrogen Ion Concentration to the Titratable Acidity of Milk, by T. J. McInerney and P. F. Sharp (pp. 257–264); Grade "A" Milk in Wisconsin, by F. C. Rath (pp. 265–268); Statistical Analysis of Bacteria Counts Made by the Direct Microscopic and Agar Plate Methods, by J. D. Brew (pp. 269–273); Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products, by G. E. Bolling (pp. 274–277); Some Results of the Reductase Test as Used in Routine Milk Analyses, by E. B. Johnston (pp. 278–284); Ice Cream in the Balance, by B. Vener (pp. 285, 286); Report of Committee on Sanitary Control of Ice Cream, by R. E.

Irwin (pp. 287-295); Report of Committee on Milk Ordinances, by W. B. Palmer (pp. 296-301); Report of Committee on Methods of Securing a Satisfactory Quality of Raw Milk for Pasteurization, by W. D. Dotterer (pp. 302-306); Report of Committee on Serving Milk in Schools, Factories, and Office Buildings, by M. O. Maughan (pp. 307-318); Chemical Sterilization in Dairy Industry, by M. J. Prucha (pp. 319-328); and The Appraisal of Milk Control Activities, by W. F. Walker (pp. 1-8).

VETERINARY MEDICINE

The practice of disinfection, A. BESSON and G. EHRINGER (*La Pratique de la Désinfection. Paris: J.-B. Baillière & Sons, 1926, pp. X+852, figs. 174*).—The first part of this work deals with sanitary police (pp. 1-201), the second part with disinfection technique (pp. 203-507), the third part with disinfection practice (pp. 509-641), the fourth part with insects and rodents (pp. 643-761), and the fifth part with disinfection for contagious and parasitic diseases (pp. 763-835).

The prevention and treatment of carbon tetrachloride intoxication, P. D. LAMSON, A. S. MINOR, and B. H. ROBBINS (*Jour. Amer. Med. Assoc., 90 (1928), No. 5, pp. 345-349*).—It is pointed out that intoxication by carbon tetrachloride can probably be prevented by avoiding the administration of carbon tetrachloride to patients with ascariasis without preliminary treatment for roundworms, refusing treatment to alcoholic addicts, having the patient avoid alcohol or food shortly before or after carbon tetrachloride administration, and insuring an adequate calcium reserve in all patients treated.

The structure of *B. anthracis* and reversal of the Gram reaction, J. W. CHURCHMAN (*Jour. Expt. Med., 46 (1927), No. 6, pp. 1007-1029, pls. 5*).—The author reports that the addition of small amounts of aqueous gentian violet, acriflavine, or acriviolet to suspensions of young cultures of *B. anthracis* reverses their Gram reaction and diminishes their diameter about 40 per cent. The time required for these changes varies with the strain of *B. anthracis* examined.

The septicemia of *Bacillus abortus* (Bang) in man [trans. title], G. FICAI and A. ALESSANDRINI (*Ann. Ig. [Rome], 35 (1925), No. 1, pp. 1-64*).—The first part of this account is a summary of the status of knowledge of Malta or undulant fever. The second part is a review of the epidemiology and distribution of Malta fever and the septicemia of *B. abortus* in man. The third and fourth parts deal with the serology, particularly agglutination, of these organisms, and the fifth part with the isolation of *B. abortus* of man, methods of isolation, identification, and its differentiation from *Micrococcus melitensis*. The sixth part deals with the clinical nature of *B. abortus* fever of man and its differentiation from Malta fever, the seventh part with vaccination against *B. abortus* fever of man, and the eighth part with prophylaxis. A bibliography of three pages is included.

Studies on the mode of spread of *B. enteritidis* mouse typhoid infection, I-IV (*Jour. Expt. Med., 46 (1927), No. 6, pp. 847-853; pp. 855-870, pl. 1; pp. 871-886, figs. 3; pp. 887-907, figs. 7*).—Four papers are here presented, as follows: Native Epidemicity, by L. T. Webster and I. W. Pritchett; and Effects of External Conditions on the Occurrence of Smooth, Mucoid, and Rough Colony Types; Studies of Bacterial Cells Taken from Smooth, Mucoid, and Rough Colonies; and The Relative Virulence of Smooth, Mucoid, and Rough Strains, all by L. T. Webster and C. Burn.

A gastro-intestinal poison produced by *Bacterium enteritidis* and by *Bacterium paratyphosum B* (aertrycke type), S. E. BRANHAM, L. ROBERT, and L. A. DAY (*Jour. Bact., 15 (1928), No. 1, pp. 36, 37*).—In the study here

reported 17 strains of *B. enteritidis* and *B. paratyphosum* B (aertrycke type) were isolated from cases of food poisoning, all of which produced typical fatal infection in mice.

The authors find that there is a heat resistant poison in young cultures of *B. enteritidis* and *B. paratyphosum* B (aertrycke type) which is toxic for mice when taken by mouth. This poison seems to be different from the toxic principle previously described, which acts only on intravenous injection. Whether it is a bacterial toxin or is a poison formed by the action of the microorganisms on the medium can be determined only by further investigation.

Thermal death point studies of *Brucella abortus*, C. M. CARPENTER and R. BOAK (*Jour. Bact.*, 15 (1928), No. 1, p. 41).—In the studies reported, human, porcine, and bovine cultures of *B. abortus* grown in milk and Hiss serum water were exposed to temperatures of 140, 142, and 160° F. for various intervals. No cultures were viable after exposure for 20 minutes to a temperature of 140°. The thermal death point of cultures most virulent for guinea pigs was higher than that of cultures which produced only mild lesions of abortion disease in the experimental animals.

Recent work on foot and mouth disease (*Jour. Amer. Med. Assoc.*, 89 (1927), No. 27, pp. 2272, 2273).—Reference is made to a paper by F. C. Minett, presented before the Association of Economic Biologists in Great Britain, and dealing with the period of survival of the foot-and-mouth disease virus in the fresh pig carcasses. In frozen and chilled beef and bacon and in salted carcasses the virus survived at least 42 days and in the bone marrow of frozen beef carcasses for at least 76 days. The virus was found to be highly resistant to destruction by phenol, compound solution of cresol, and certain coal tar disinfectants. Experiments pointed to formaldehyde as being a reliable agent for general disinfection, as well as for special purposes, such as disinfecting the outsides of contaminated animal hides.

Metal fume fever.—V, Results of the inhalation by animals of zinc and magnesium oxide fumes, K. R. and P. DRINKER (*Jour. Indus. Hyg.*, 10 (1928), No. 2, pp. 56-70, figs. 3).—Following an introductory account, the authors report upon experimental work with zinc oxide and magnesium oxide. The studies indicate that exposure to zinc oxide fume causes a heavy outpouring of polymorphonuclear leucocytes—a reaction to which there is a definite latency. In severely exposed animals, especially cats, the irritative process may go on into broncho-pneumonia. Although the magnesium in the experiments caused less marked results than did the zinc, it is the authors' opinion that larger doses would produce more marked reactions.

A list of 19 references to the literature is included.

Studies on a paratyphoid infection in guinea pigs.—IV, The course of a second type of *Salmonella* infection naturally appearing in the endemic stage, J. B. NELSON (*Jour. Expt. Med.*, 47 (1928), No. 2, pp. 207-217, fig. 1).—This fourth contribution (*E. S. R.*, 58, p. 277) deals with a second type of *Salmonella* infection naturally appearing during the endemic stage of an earlier outbreak.

The relation of paratyphoid bacilli to food poisoning, E. O. JORDAN (*Amer. Jour. Pub. Health*, 17 (1927), No. 12, pp. 1221-1225).—The author here deals with confusion in nomenclature, classification, intoxication or infection, prevention of paratyphoid food poisoning, and cooking food a safeguard. The species that are particularly dealt with include *Bacillus enteritidis*, *B. suispestifer*, and *B. aertrycke*.

The method of division of the rough and smooth type of colonies among bacilli of the *Salmonella* group, M. M. NUTT (*Jour. Hyg. [London]*, 26 (1927), No. 1, pp. 44-48, figs. 8).—A discussion of the technique employed in the detection of these two types of colonies, in which *Bacillus aertrycke* is used.

The strangles streptococcus, BROCC-ROUSSEU, FORGEOT, and A. URBAIN (*Le Streptocoque Gourmeux. Paris: Rev. Path. Compar. et Hyg. Gén.*, 1925, pp. 115).—Chapter 1 (pp. 3-18) of this work deals with the history of the discovery and study of the strangles microbe, *Streptococcus equi*. Chapter 2 (pp. 19-71) is devoted to a report of studies of this streptococcus, including its characteristics, the unicity of the organism as shown by its complement fixation and hemolytic action, passages by inoculation of laboratory animals and in different media, proteolytic action, hemolysis, virulence, and toxicity. Chapter 3 (pp. 72-87) is devoted to a consideration of antistrangles serotherapy, chapter 4 (pp. 88-96) to vaccination, and chapter 5 (pp. 97-103) consists of a résumé of the characteristics of the organism. A bibliography of 9 pages is included.

An epidemiological study of undulant fever in Michigan, P. F. ORR and I. F. HUNDLESON (*Amer. Jour. Pub. Health*, 17 (1927), No. 12, pp. 1242-1247).—This is a contribution from the Michigan State Department of Health and the Michigan Experiment Station on a study commenced in June, 1926, since which time 16 cases of undulant fever have been investigated. They are here reported upon under the headings of age distribution, history of patients, cases scattered, examination of patients' families, accounting for the small number of cases, the medical profession alert, and a public-health problem. The cases studied were distributed throughout 10 of the 83 counties of the State.

Recent cases of undulant fever in New York State, R. GILBERT and M. B. COLEMAN (*Jour. Bact.*, 15 (1928), No. 1, pp. 40, 41).—The authors report that in a series of 15 specimens submitted for examination for evidence of enteric disease, but with clinical histories more suggestive of undulant fever, the blood serum agglutinated cultures of the *melitensis-abortus* group. During the course of the investigations two laboratory infections occurred, one with *Bacterium melitensis*, resulting in a prolonged and severe illness, and the other with *B. abortus*, followed by very mild symptoms. The strain of *B. abortus* was far more virulent for guinea pigs than that of *B. melitensis*.

The relationship of undulant fever of man to epidemic abortion of animals, P. BASSETT-SMITH (*Jour. State Med.*, 35 (1927), No. 9, pp. 508-512).—This is a brief discussion in connection with seven references to the literature.

A study of contagious abortion in cattle (*South Carolina Sta. Rpt. 1927*, pp. 65, 66).—In referring briefly to work with this disease it is stated that vaccination has been successful to a certain degree in reducing the number of abortions.

Abortion in cattle and Malta fever (*Amer. Jour. Pub. Health*, 17 (1927), No. 12, pp. 1250, 1251).—A general discussion of the problem.

The relation of Mediterranean fever to contagious abortion in cattle (*Jour. Roy. Army Med. Corps*, 49 (1927), No. 2, pp. 107-115).—This is an extended editorial, in which the literature on the subject is reviewed.

Histopathology of piroplasmosis and anaplasmosis of bovines [trans. title], P. JIMENEZ DE ASUA, R. L. DIOS, J. A. ZUCCARINI, and M. J. KUHN (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 30, pp. 1314-1316).—A study of the histopathological lesions of the hematopoietic organs which occur in these diseases.

Paratubercular enteritis of cattle in Lombardy [trans. title], R. ANDREONI (*Oltn. Vet. [Milan]*, 50 (1927), No. 10, pp. 582-603, pls. 4).—This is a general systematic account of Johne's disease which occurs in the Padana Valley, a region of intensive agriculture.

The administration of draughts to sheep and cattle, with special reference to treatment for verminous gastro-enteritis, E. L. TAYLOR (*Ann. Trop. Med. and Parasitol.*, 21 (1927), No. 1, pp. 27-34).—The author finds that medicaments administered to yearling sheep from wine bottles go direct to the abomasum, only a small portion going to other compartments of the stomach. Medicaments administered to cattle in this way usually go to the rumen and reticulum, and rarely reach the abomasum directly. The quantity given, and the way in which the animal receives it, seems to have no bearing upon its flow into the various stomach compartments. When administered to cattle or sheep by means of the stomach tube they may go to the rumen only. These conclusions are based upon the administration of a 1 per cent solution of methylene blue, varying in quantity from 10 to 30 oz., in the usual farm way to 13 cattle.

Notes on the toxicity of tartar emetic given intravenously to cattle, with especial reference to the drug's action on the liver, H. E. HORNBY (*Vet. Rec.*, 8 (1928), No. 3, pp. 41-45, pl. 1).—The author concludes that the intravenous administration of even therapeutic doses of tartar emetic to cattle is by no means without grave danger. The most serious toxic action of the drug is on the liver, where it is liable to provoke central necrosis closely resembling acute yellow atrophy of human pathology. Great differences exist between individual animals concerning their susceptibility to this form of poisoning, cachectic animals being very much more susceptible than lusty ones.

The bovine theilerioses. A comparative study of Theileria parva of South Africa and T. dispar of North Africa [trans. title], E. SERGENT, A. DONATIEN, L. PARROT, F. LESTOQUARD, and E. PLANTUREUX (*arch. Inst. Pasteur Algérie*, 5 (1927), No. 2, pp. 161-187, figs. 5).—The authors conclude that these forms represent two distinct species, this being shown by the absence of any cross immunity.

Braxy-like disease of sheep in Hawke's Bay: Its association with liver-fluke, C. S. M. HOPKIRK (*New Zeal. Jour. Agr.*, 35 (1927), No. 3, pp. 141-150, figs. 2).—Studies on the relation of these two affections show that they occur at the same season of the year, usually in autumn and early winter. Deaths from fluke alone occur later in the spring and summer. It was found in the course of the investigations that sheep were becoming infested with young flukes at the time of death, and that necrotic areas in the liver are caused by *Bacillus oedematis*. This organism was found in liver tissue broken down by young flukes.

The use of carbon tetrachloride in distomatosis of sheep [trans. title], L. DE BLEECK and E. A. R. F. BAUDET (*Tijdschr. Diergeneesk.*, 54 (1927), No. 17, pp. 825-830; *Ger., Fr., Eng. abs.*, pp. 829, 830).—Capsules containing carbon tetrachloride in doses of 1 cc. are said to have been used with success in combating this parasitic affection of sheep.

Some miscellaneous observations on the anthelmintic value of carbon tetrachloride in sheep, R. F. MONTGOMERIE (*Vet. Jour.*, 82 (1926), No. 618, pp. 583-591).—Single experiments conducted indicated "(1) that simultaneous administration of magnesium sulfate did not interfere with the known efficiency of dosage with 1 cc. of carbon tetrachloride in the treatment of liver rot, and that the double administration had little effect on the alimentary nematode infestation; (2) that 5 cc. of carbon tetrachloride, administered together with

magnesium sulfate, was efficient against mixed (liver fluke and alimentary nematode) infestation, a small proportion of the nematodes only escaping destruction."

The impossibility of immunizing the goat against *Micrococcus melitensis* with large doses of vaccine [trans. title], BURNET (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1927), No. 26, pp. 1627-1629).—Studies are reported which show that it is impossible to immunize the goat against undulant fever through the subcutaneous administration of large doses of a bacterin.

Concerning coccidiosis of swine in Russia [trans. title], W. L. YAKIMOFF, J. G. GALOUZO, E. F. RASTÉGAÏFF, and W. A. LOUKIANOFF (*Bul. Soc. Path. Exot.*, 20 (1927), No. 3, pp. 215-218).—Investigations conducted in Russia have shown coccidiosis of swine to occur in the Provinces of Leningrad, Moscow, Wiatka, Ekaterinoslav, Oukwaine, and Baku, and it is probably even more widespread.

Inheritance of scrotal hernia in swine, B. L. WARWICK (*Ohio Sta. Bimo. Bul.*, 13 (1928), No. 1, pp. 15-18, figs. 2).—This is a brief practical account based upon breeding experiments commenced at the Wisconsin Experiment Station and continued at the Ohio Experiment Station, a report of which has been noted (*E. S. R.*, 56, p. 129). It has been found that the scrotal hernia of swine is definitely heritable and that no boar should be used which is or has been afflicted.

Paralysis of the hindquarters in pigs, E. J. SHELTON (*Queensland Agr. Jour.*, 28 (1927), No. 5, pp. 505-521, figs. 11).—An extended account of this affection, in which the various causes of paralysis are considered, together with preventive measures and treatment applicable.

The swine sanitation system as developed by the Bureau of Animal Industry in McLean County, Ill., H. B. RAFFENSPERGER and J. W. CONNELLY (*U. S. Dept. Agr., Tech. Bul.* 44 (1927), pp. 20).—The author presents the subject under the headings of historical summary; description of the swine sanitation system; progressive results of the work, 1920 to 1925; and comparative results of spring and fall farrowings. It is found that upon following the sanitary system (*E. S. R.*, 57, p. 772) for reducing the ascarid infection of pigs the number marketed is increased to about 76 per cent of the pigs farrowed, while under ordinary farm conditions, with pigs in dirty hog lots, only about 50 per cent of the pigs farrowed are marketed.

A list of 17 references to the literature is included.

On the hydrogen-ion concentration of the blood of the horse [trans. title], M. BREY (*Arb. Deut. Gesell. Züchtungsk.*, No. 32 (1926), pp. [4]+86, figs. 8).—A monographic account with 210 references to the literature. The investigations reported have led to the conclusion that normally the hydrogen-ion concentration of the blood of the horse lies between pH 7.20 and 7.55.

Etiology of angina of the horse and treatment by antistreptococcic virus [trans. title], B. GOURVITCH and L. BLOCH (*Compt. Rend. Soc. Biol. [Paris]*, 96 (1927), No. 10, pp. 663, 664).—The bacterial examination by the authors of 23 cases of angina in the horse revealed the presence of streptococci in the nasal secretion of nearly all the cases. The intravenous injection of the antistreptococcic virus of Besredka resulted in a cure of all the affected animals in from 4 to 6 days.

Botulism in the horse [trans. title], J. WESTER (*Tijdschr. Diergeneesk.*, 55 (1928), No. 1, pp. 30-40; *Eng., Ger., Fr. abs.*, pp. 39, 40).—A discussion of this subject in which it is suggested that the intoxications in horses and cattle occurring in the Netherlands, accompanied by symptoms of paralysis with or without difficulty in chewing and swallowing, may be due to a variety of *Bacillus botulinus*.

New observations on the use of antistreptococcic virus in malignant edema of the horse [trans. title], I. SADOWSKY (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 33, pp. 1452, 1453).—A report upon observations of affected animals injected intravenously with 100 to 130 cc. of polyvalent anti-virus made from streptococci isolated from affected animals. Of 14 animals treated but 2 died.

"Grass disease" in horses, W. A. POOL (*Vet. Rec.*, 8 (1928), No. 2, pp. 23-31).—A general discussion of this disease, with references to the literature.

Melioidosis in a horse, A. T. STANTON, W. FLETCHER, and S. L. SYMONDS (*Jour. Hyg. [London]*, 26 (1927), No. 1, pp. 33-35).—A study of this affection, due to *Bacillus whitmori*, in a race horse. While the symptoms and anatomical changes of this disease are almost indistinguishable from those of glanders, the causative organism possesses characters which distinguish it at once from *B. mallei*. Agglutination, absorption, and fixation tests show that *B. whitmori* is closely related to certain strains of the glanders bacillus from India and Java, but that its kinship with the strains of *B. mallei* in the National Collection of Type Cultures is very remote.

Transmission of surra among animals of the equine species, R. A. KELSEY (*Philippine Jour. Sci.*, 34 (1927), No. 2, pp. 115-141, pls. 2).—The studies here reported have led the author to conclude that *Tabanus striatus* is the common disseminator of surra, in the Philippine Islands at least, the method of transmission being purely mechanical. Other arthropods tested for transmission include the stable fly, *Lyperosia exigua*, *Boophilus australis*, *Dermacentor reticulatus*, and the yellow-fever mosquito. The account includes a list of 25 references to the literature.

Helminthiasis of the fowl [trans. title], T. VAN HEELSBERGEN (*Tijdschr. Diergeneesk.*, 55 (1928), No. 1, pp. 6-25, figs. 13; *Ger., Eng., Fr. abs.*, p. 25).—A discussion of the helminth parasites of the hen that occur in the Netherlands, and control measures applicable.

A comparison of the effectiveness of vaccination against Pasteurella avicida by the oral, subcutaneous, and intravenous methods, L. BARNES (*Jour. Bact.*, 15 (1928), No. 1, p. 43).—This is a brief report of experiments performed on chickens and rabbits with a view to comparing the resistance of animals injected with *P. avicida* vaccine by the oral, subcutaneous, and intravenous methods. The relative effectiveness of each method was determined by administering test doses of the virulent organisms following immunization.

The results indicate that the intravenous method is the most effective in producing agglutinins for the organisms and in bringing about actual resistance to infection, while the oral method is least efficient.

Vaccination for roup and its allied disorders in poultry, G. W. STILES, JR. (*Rel. Poultry Jour.*, 33 (1926), No. 9, pp. 541, 542, 593, 595).—In the discussion of this subject the author reports that vaccination has proved to be of more value as a means of prevention than any other measure employed. Vaccination with a bacterin made from pure cultures of an avian strain of *Staphylococcus pyogenes aureus*, isolated nearly three years before from a flock of 1,100 hens suffering from diphtheritic roup with a loss of 463 birds, proved to be the most valuable agent encountered both for the prevention and cure of fowls.

Three species of bird malaria, *Plasmodium praecox*, *P. cathemerium* n. sp., and *P. inconstans* n. sp., E. HARTMAN (*Arch. Protistenk.*, 60 (1927), No. 1, pp. 1-7, pls. 2).—The species *P. cathemerium*, described as new, was found in the English sparrow in Baltimore and *P. inconstans* in the same host from Virginia.

Coccidiosis in willow grouse [trans. title], A. BRINKMANN (*Bergens Mus. Aarbok Naturv. Raekke*, 1926, No. 2, Art. 9, pp. 71, pl. 1, fig. 1; *Eng. abs.*, pp. 58-64).—This is an account of coccidiosis of the willow grouse (*Lagopus lagopus*) in Norway, where the development of *Eimeria avium* was found to agree in general with that observed by Fantham in the grouse (*E. S. R.*, 24, p. 684). Examinations of the willow grouse showed that the jejunum was most generally infected and that the duodenum was also frequently infected. In the willow grouse coccidiosis is especially a disease of young birds, 75 per cent of those examined being infected. It was also common in adult birds, 49 per cent of which were infected, but the infection was much more severe in the young birds. The author has found coccidiosis among grouse in Iceland and Spitsbergen, apparently being endemic almost wherever grouse are found.

Coccidiosis therapy.—I, The coccidiosis of rabbits [trans. title], B. J. KRIJGSMAN (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 101 (1926), No. 1-3, pp. 108-126, pl. 1, figs. 7; *abs. in North Amer. Vet.*, 8 (1927), No. 9, p. 74).—The experimental part of this account of coccidiosis of the rabbit deals with the use of atoxyl and of creolin. Atoxyl was of little value in combating this parasite, but creolin was found to be of value in all stages of the disease. It is administered in doses of 20 cc. of 0.25 per cent solution per kilogram of body weight, three doses being given at intervals of 24 to 48 hours either before or after the oocysts appear in the feces. The account includes a list of 29 references to the literature.

Epidemic encephalitis in foxes, R. G. GREEN, N. R. ZIEGLER, H. O. HALVORSON, B. B. GREEN, and E. T. DEWEY (*Jour. Bact.*, 15 (1928), No. 1, pp. 47, 48).—This is a preliminary account of studies extending over a period of 3 years of a disease epidemic among silver foxes, in which the natural mortality was from 10 to 25 per cent, while the mortality in artificially infected animals was close to 100 per cent. The exact nature of the infective agent has not yet been determined, although a streptococcus is suspected.

Intermediate host of liver-fluke in New Zealand, C. S. M. HOPKIRK (*New Zeal. Jour. Agr.*, 35 (1927), No. 3, pp. 175-177).—The common water snail *Potamopyrgus antipodum zelandeae* has been found to be the intermediate host of the liver fluke in New Zealand.

AGRICULTURAL ENGINEERING

The determination of the duty and control of irrigation water, G. H. W. BARNHART (*Assoc. Hawaii. Sugar Technol. Rpt.*, 5 (1926), pp. 106-120, figs. 8).—Experiments on the duty and control of irrigation water are reported which demonstrated the value of shorter intervals between irrigations in the better growing months. A considerable amount of data is reported from which no conclusions are drawn.

Irrigation in the Empire: Memorandum and questionnaire, B. A. KEEN ([London]: *Empire Marketing Bd.*, 1927, pp. 8).—A review of the status of irrigation in the British Empire is presented.

Overhead irrigation, K. D. BOND (*Assoc. Hawaii. Sugar Technol. Rpt.*, 5 (1926), pp. 93-105, figs. 2).—Data from experiments with overhead irrigation are reported which showed that the saving in labor per crop will pay for the installation on the assumption that yields under sprinklers are no more than equal to those from contour fields. Equalization of pressure along the lateral is necessary to obtain proper distribution.

Sprinkling irrigation on vegetable farms in New Jersey, H. F. HUBER, E. R. GROSS, and D. B. LUCAS (*New Jersey Stat. Bul.* 453 (1927), pp. 48, figs. 27).—The results of an investigation in the use of sprinkling irrigation on vegetable farms in New Jersey, conducted jointly by the departments of horti-

culture and agricultural engineering at the station, are presented in considerable detail, together with practical information on the organization, planning, and installation of the systems. A special part of the bulletin is devoted to the mechanical equipment required.

Garden hose water, J. B. MARCELLUS (*Water Works*, 66 (1927), No. 12, p. 492).—Data on the flow of water through ordinary garden hose, based on 300 tests, are presented and discussed briefly.

Subsoil as a factor in drainage design, S. A. NORLING (*Agr. Engin.*, 8 (1927), No. 11, pp. 311-319, figs. 15).—The results of a large number of studies conducted at the Minnesota Experiment Station are reported and discussed.

The conclusion is drawn that the texture of the soil is one of the most important factors in drainage design. It has been found that the velocity of the flowing underground water varies as the square of the effective diameter of the soil grain. The velocity of the soil water toward an outlet is 100 times larger in a medium sandy soil with an average effective diameter of the soil grain equal to 0.5 mm., than in a silt soil with an average effective diameter of the soil grain equal to 0.05 mm. Spacing tile drains from 80 to 100 ft. is, therefore, usually sufficient to drain a silt soil properly, while theoretically drains located from 8,000 to 10,000 ft. apart should be sufficient to convey the excess water in a medium sand soil.

The conclusion is also drawn that the danger of excessive drainage on land areas where the surface soil is underlaid by a coarse textured subsoil must always be kept in mind. On the other hand, deep peat underlaid by a water-bearing stratum is in no danger of drought and can not be overdrained.

General instructions to resident engineers and superintendents of construction on national forest roads and national parks roads, 1926 (*U. S. Dept. Agr., Bur. Pub. Roads*, 1926, pp. IV+33, figs. 8).—The text of these instructions is given in considerable detail.

Report of a survey of transportation on the State highway system of Ohio (*U. S. Dept. Agr., Bur. Pub. Roads*, 1927, pp. 155, [pls. 7], figs. [55]).—This report contains the results of highway traffic studies of the State, county, and township road systems of Ohio conducted during 1925 under a cooperative research agreement between the U. S. D. A. Bureau of Public Roads and the Ohio Department of Highways and Public Works.

Comparative strength properties of the principal Philippine commercial woods, J. C. ESPINOSA (*Philippine Jour. Sci.*, 33 (1927), No. 4, pp. 381-395, pl. 1).—In a contribution from the Philippine Bureau of Science, data from mechanical tests of some Philippine commercial woods are presented in tabular form and compared with Philippine mahogany. No conclusions are drawn.

Prolonging the life of tobacco shade tent poles, H. W. HICOCK and P. J. ANDERSON (*Connecticut State Sta., Tobacco Substa. Bul.* 9 (1927), pp. 12, figs. 6).—The results of an investigation on the application of preservatives to tobacco shade tent poles are presented, and methods of practical procedure are described. Attention is drawn to the fact that 350,000 chestnut poles are used to support the tobacco shade tents of the Connecticut Valley. Most of the native species suitable for this purpose are naturally nondurable in contact with the soil. It has been found that the durability of poles can be greatly increased by the use of preservatives to keep out the organisms causing decay. Coal tar creosote or some product derived from it is deemed the best material to use. Immersing the butt of a pole in a hot bath at a temperature of 220° F. and then in a cool bath at a temperature of 100° has been found to result in the absorption of about 0.5 gal. of oil and in a penetration of from 0.5 to 1 in.

Notes as to the substitution of other woods for chestnut are included.

Concrete-work on the farm, A. W. HUDSON (*New Zeal. Dept. Agr. Bul. 125* (1926), pp. 31. figs. 24).—Practical information on the use of concrete on New Zealand farms is presented.

Power plant testing, J. A. MOYER (*New York and London: McGraw-Hill Book Co., 1926, 3. ed., rev., pp. XI+609, figs. 423*).—This, the third revised edition of this book, is a manual of testing engines, pumps, refrigerating machinery, fuels, lubricants, materials of construction, and the like.

General information for refiners of petroleum regarding tests of lubricating oils at the Engineering Experiment Station, Annapolis, Maryland (*U. S. Dept. Navy, Bur. Engin. Pamphlet NSE No. 31, rev., 1926, pp. [1]+10*).—A brief outline of tests of lubricating oils is presented.

Electricity in agriculture, C. BUSCHKIEL (*Elektrizität in der Landwirtschaft. Berlin: Walter de Gruyter, 1927, pp. XII+171, figs. 185*).—This book presents information on the application of electricity to agricultural practices. It contains chapters on electrotechnical facts, production of high-tension electrical current, use of high-tension electricity in agriculture, installation of electrical equipment, low-tension electrical plants in agriculture, and answers to practical questions. Considerable working data are included.

Electrical service for rural districts, J. W. PURCELL (*Agr. Engin., 8* (1927), Nos. 11, pp. 297-300, figs. 3; 12, pp. 345-348, figs. 2).—Part 1 of this report presents data on rural electrification as administered by the Hydro-Electric Power Commission of Ontario, part 2 deals with the design of rural distribution systems under the same administration, and part 3 presents data on operation and results under this system, together with information on rates.

The status of rural electrification in New Jersey, R. C. OLEY (*N. J. Dept. Agr. Circ. 112* (1927), pp. 32, fig. 1).—The results of a survey of the use of electricity on farms in New Jersey are presented and discussed. They indicate that rural service from central stations has been available only during the past five or six years. During that period the companies have made large strides into the country, and new rural extensions are being constructed constantly.

Electro-farming, R. B. MATTHEWS (*Scot. Jour. Agr., 10* (1927), No. 3, pp. 271-279).—A review of the present status of the use of electricity in British agriculture is presented.

Draw-bar tests at Peradeniya, T. H. HOLLAND and L. LORD (*Trop. Agr. [Ceylon], 69* (1927), No. 2, pp. 76-84, pls. 4).—The results of drawbar tests of various agricultural implements conducted at the experiment station at Peradeniya are tabulated and discussed.

For dry cultivation of other than coconut estates an all-steel moldboard plow was found to give the best results. It was also best for use on coconut estates for plowing in heavy weed growth or green manures. The disk harrow was the most effective implement for shallow cultivation. For the first plowing of paddy, where there is a strong weed growth or green manure to plow in, a wooden beam plow with wheel is recommended for use with average cattle. With cattle above the average in size, the all-steel plow is recommended. Thorough harrowing with a Burmese harrow is recommended as a substitute for mud plowing.

Artificial drying of alfalfa and other crops, H. E. KIEFER (*Agr. Engin., 8* (1927), No. 12, pp. 329-333, figs. 4).—The results of an intensive study of the artificial drying of alfalfa and other crops are summarized and discussed. It has been found that the artificial curing of some young crops makes feeds which are superior to some concentrates. Artificial curing of alfalfa not only results in a much superior feeding value, but by avoiding field losses enables the recovery of at least 20 per cent greater tonnage per acre. The weather

hazard is eliminated to a large degree, and all weed seeds are sterilized. It is claimed that artificially cured rye hay was found to contain almost double the amount of protein and treble the amount of fat in sun-cured rye hay. Good results were obtained from oats hay, indicating the possibility of securing large crop yields in less than eight weeks.

Basic principles involved in the design of the small feed grinder, W. C. KRUEGER (*Agr. Engin.*, 8 (1927), No. 7, pp. 167-171, figs. 10).—In a contribution from the Wisconsin Experiment Station, the results of studies of the hammer mill are reported. These indicate that the capacity of the mill increases as the speed decreases, although not in direct proportion, and the product becomes coarser. The available data point to the theory that a larger screen at high speeds will produce the same product as smaller screens at slower speeds and with a higher efficiency.

The horsepower required was found to be directly proportional to the rate of feeding, the power increase rate being practically the same for the $\frac{1}{8}$ - and $\frac{1}{4}$ -in. screens. The horsepower with the $\frac{1}{4}$ -in. screens increased more rapidly, due to the limited screen area. The fineness varied in inverse proportion to the rate of feeding and was reflected in every horsepower change, indicating that for each set of conditions there is a critical point in the quantity fed a hammer mill at which the mill is most efficient and at which a heavier or lighter feed results in either a coarser product or fewer pounds per horsepower hour, or both. Feed reduction appeared to be affected by the action of the hammers plowing through the layer of material on the screen. The thickness of this layer constitutes the critical factor in the rate of feeding.

At high speeds the feed is carried around almost parallel to the screen surface, making the openings only partially effective. The result is the same as though a smaller size screen is used at slower speeds, for at slower speeds the grain impinges against the screen at a greater angle and more and coarser feed passes through. The use of thinner screen stock gives better results, and woven screens are better than punched screens.

Removing the screen produced a hulled and cracked grain product, varying with the speed but never satisfactory. The results indicate that an area of high pressure pads the hammer faces, particularly in the broader hammers, preventing a sharp impact. For any particular speed, the rate at which the feed may be introduced into the mill is determined by the total area and number of the screen perforations. The use of a fan appeared to result in a coarser feed and an increased capacity. No difference in rate or fineness was noticeable.

The results indicate that the more nearly solid the cross line of the hammer rows the better are the results obtained, with the T-hammers which present an almost solid cross line giving the best results. There was no apparent advantage in staggering hammers. The test results did not substantiate the general idea that the initial impact of the hammers against the feed does the grinding, as it was shown quite conclusively that all of the grinding is done by the extreme tips of the hammers plowing through a fluffy, whirling layer of material between the periphery of the hammers and the housing. All of the experiments tended to indicate that with the cereals the rubbing action is by far the most important, and that the explosion due to initial compact is negligible. With corn and other heavy and brittle materials impact is probably of greater importance. The choice between swing or rigid hammers can apparently be made without regard to grinding effect.

The German green feed silo, K. NAUE (*Der Deutsche Grünfuttersilo. Berlin: Paul Parey, 1926, pp. VIII+166, figs. 95*).—This is an extensive discussion of the historical development of silos in Germany, of the ensiling process, and

of the different features of silo construction. The economic significance of silos is also discussed. An extensive bibliography is included.

Quick chilling and freezing of meat and fish in atomized brine, M. T. ZABOTSCHEWZEFF (*Cold Storage*, 30 (1927), No. 353, pp. 263, 262).—The results of experiments in the freezing of pork carcasses are tabulated.

Wind pressures on structures, H. L. DRYDEN and G. C. HILL (*U. S. Dept. Com., Bur. Standards Sci. Paper 523* (1926), pp. 697-732, pls. 3, figs. 20).—Part 1 of this paper is a general discussion of the subject, including a general survey of the effects of a uniform and steady wind and some consideration of the allowances to be made for the gustiness of the wind. Typical values of the coefficient of wind pressure are given for various types of models.

In part 2 wind tunnel experiments are reported on a square base prism 24.25 in. high with a base 8 in. square at wind speeds up to 70 miles per hour. The pressure was measured at 70 points on one face and at 49 points on the top for wind directions varying from 90° to one face to 90° to the opposite face by 15° steps. The ground was represented by a fixed platform in one series of tests and by the tunnel floor in another.

It was found that the greatest average pressure against the building occurs when the wind blows normal to a face and is equal to 1.5 times the velocity pressure, that is, 22 lbs. per square foot for a true speed of 76 miles per hour. The average decrease in pressure over the roof is about 0.84 times the velocity pressure, that is, 12.4 lbs. per square foot for a true speed of 76 miles per hour. The maximum moment about a vertical axis is equivalent to a horizontal displacement of the resultant force of 0.077 times the width of the building.

The design of the Kansas home, H. E. WICHEES (*Kans. Engin. Expt. Sta. Bul. 19* (1927), pp. 84, figs. 62).—Practical information is given on the design of homes particularly adapted to Kansas conditions.

Relation of toilet type to typhoid prevalence, K. W. GRIMLEY (*Pub. Works*, 58 (1927), No. 11, pp. 425, 426, figs. 2).—Data are reported from Jefferson County, Ala., showing the numbers of typhoid cases where pit toilets, septic tanks, sewer connections, box and can toilets, and open toilets prevail. Of the 92 cases of typhoid reported in 1926, approximately 41 per cent occurred in homes served by box and can toilets, 24 per cent in homes served by pit toilets, 27 per cent in homes having open or surface toilets, and 8 per cent in homes served by sewers or septic tanks.

Study of sewage settling tank design, C. H. CAPEN, JR. (*Engin. News-Rec.*, 99 (1927), No. 21, pp. 833-837, figs. 5).—Studies are reported the results of which indicate that the majority of settling tanks are inefficient, the efficiency being reduced by the presence of excessive amounts of sludge and scum. The most efficient tank has been found to be one with an even distribution of flow at both inlet and outlet ends, both being preferably submerged and arranged symmetrically. The depth of the tank apparently has little effect on its efficiency. Long, narrow tanks are not generally as good as those with a ratio of length to width of between 4 to 1 and 5 to 1. Baffles can be helpful but are more often detrimental than useful. Velocity has been found to be an important factor in design, although high accidental velocities due to sludge accumulation may be harmful.

Digestion of sewage screenings, H. HEUKELEKIAN (*Pub. Works*, 58 (1927), No. 12, pp. 455-457, figs. 3).—Studies conducted at the New Jersey Experiment Stations are reported, the results of which indicate that the digestion of screenings either separately or in conjunction with fresh solids is feasible. The rate of digestion of screenings was found to be as rapid as that of the screened fresh solids, and the volume of gas produced from screenings was as high as that from fresh solids.

RURAL ECONOMICS AND SOCIOLOGY

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul.*, 13 (1928), No. 1, pp. 27-32).—Results of investigations in rural economics are reported as follows:

The distribution of population by age groups on farms, in villages, and in cities in Ohio, P. G. Beck (pp. 27, 28).—A study of two townships in northwestern Ohio indicates that about 50 per cent of the children born on farms have gone into urban occupations. According to the 1920 census, the number of persons under 15 years of age per 1,000 persons 20 to 44 years of age in Ohio was 994 on farms, 888 in villages, and 611 in cities.

The distance walked in the feeding and care of livestock, J. F. Dowler (pp. 28-30).—From 33 to 170 miles, averaging 99 miles, per month were walked in feeding livestock on 11 Putnam County farms. The distance per animal unit varied from 3.7 to 11.4 miles, averaging 6.3 miles, the lowest two distances being on farms having 9 and 29 animal units, and the highest two on farms with 12 units each.

Index numbers of farm taxes in Ohio, H. R. Moore (pp. 30, 31).—A table is given showing by years, 1880-1926, the indexes of farm taxes and prices of Ohio farm products, using 1913=100, the index of taxes in terms of prices, and for the years 1880, 1890, 1900, 1910, 1920, and 1926 the amount of tax per capita in current dollars and in constant dollars adjusted to the terms of prices of Ohio products. The index of taxes was computed from the tax valuations in 88 townships selected as the most rural townships in 88 counties of the State. The tax per capita was found to have increased from \$6.11 in 1880 to \$32.81 in 1926, as measured in current dollars, or from \$6.83 to \$22.02 as measured in constant dollars.

Index numbers of production, wages, and prices, J. I. Falconer (p. 32).—The table previously noted (*E. S. R.*, 58, p. 381) is brought down through October, 1927.

[Investigations in agricultural economics at the South Carolina Station, 1926-27] (*South Carolina Sta. Rpt. 1927*, pp. 68-81, figs. 3).—Results not previously noted of investigations during the year ended June 30, 1927, are reported as follows:

The land real estate market in Anderson County (pp. 70, 71).—A study of about 12,000 deeds and 400 farm-sale transactions, farm-management records, and other data showed that the value of land in this area follows roughly the value of cotton and has a cyclical movement. Productiveness over several years was found to be probably the best measure of the value of land.

Credit study of South Carolina (pp. 72, 73).—Records as to farm organization, production, and credit details were obtained from 225 farmers in the Piedmont, Sand Hill, and Coastal Plain areas. Most of the farms were producing most of the food for the farm family, and large amounts of credit were not needed for consumptive purposes. A detailed study of 170 Piedmont farms operated by owners showed that most of the operators borrow from \$300 to 1,000 annually for a period of about six months to buy fertilizer and provisions and to pay labor.

Farm management study of Pee Dee area (pp. 73, 74).—The 1925 and 1926 records show that the quantity of fertilizer used per acre is the main factor in the efficient production of crops, and that profits increase with size of farm.

Cotton marketing investigation (pp. 79-81).—About 3,000 cotton samples with price and grade information were collected in 1925 and 1926. These showed lack of uniformity in grading and unscientific selling.

The place of hog production in Corn-Belt farming, H. C. M. CASE and R. C. ROSS (*Illinois Sta. Bul.* 301 (1927), pp. 145-179, figs. 7).—The cost studies

presented in this bulletin are based upon over 200 full-year records from more than 50 cooperating farmers. Three areas in Illinois were included, the records for Hancock and Franklin Counties covering the years 1913-1922, and those for Champaign and Piatt Counties the years 1920-1925. Tables are given for each area showing by years the average cost of producing 100 lbs. of hogs and the price at which the hogs sold, and the cost per 100 lbs. and the percentage of total cost of the different items entering into the cost of production.

The average annual price per 100 lbs. for which hogs sold exceeded the cost of production per 100 lbs. each year in Hancock County by from 29 cts. to \$5.13. Hogs were produced at a loss in 4 out of the 10 years in Franklin County, the profits and losses varying from a profit of \$4.69 to a loss of \$3.27 per 100 lbs. The profits and losses varied from a profit of \$2.36 to a loss of \$3.87 in Champaign and Piatt Counties, there being losses in 2 of the 6 years. The percentages of total cost for the 10-year period in Hancock County were for man labor 5.9, horse labor 0.8, interest 2.8, buildings and equipment 1.6, overhead 2.6, miscellaneous 2.2, and feed 84.1. Those for the 10-year period in Franklin County were 7.5, 1.2, 2.4, 0.6, 3.7, 0.8, and 83.8, respectively, and those for the 6-year period in Champaign and Piatt Counties were 8.3, 1, 3, 2.6, 5.8, 3.1, and 76.2, respectively.

The factors to be considered in fitting the hog enterprise to the individual farm and hog production as a means of adjusting sales of farm products to market conditions are discussed. Tables are included showing the average monthly prices of light and heavy hogs on the Chicago market from 1921 to 1925, inclusive, the differences in value of spring and of fall pigs when sold as light and heavy hogs, and the returns per bushel of corn when feeding hogs to heavier weights.

A study of peasant farming in a dairy region [trans. title], I. N. BAKULIN (*Trudy Vologodsk. Moloch. Khoz. Inst. (Arb. Mlchiv. Inst. Wologda) Bül.* 66 (1927), pp. 58).—This study discusses the economic groupings, the distribution of land and animals among the groups, the area under cultivation, products, marketing methods, and cooperative organizations.

Principles of agricultural credit, V. P. LEE (*Ann Arbor, Mich.: Edwards Bros., 1927*, pp. [2]+283, pls. 3).—This is a mimeographed textbook with questions and problems following each chapter. Chapters 1 to 3 (pp. 1-49) discuss the importance of credit in agriculture, the conditions under which credit originates, and the factors determining the direction of its flow. Part 2 (pp. 50-188) analyzes the purposes for which agriculture needs investment, operating and consumption credit, considering the security offered, length of loans, methods of repayments, and other factors, the appraisal of security for operating long-term loans, and the legal forms and aspects of farm security. Part 3 (pp. 189-283) deals with the development of credit institutions for farmers, the commercial bank and farm loans, farm mortgage banks, and the intermediate credit banking institutions.

Agricultural credit in France, L. TARDY (*Le Crédit Agricole en France. Paris: Impr. P. & A. Davy, [1927?]*, pp. 20).—This is a report, with a note by S. de Lestapis, prepared for the International Economic Conference at Geneva in May, 1927. It covers the history, organization, functioning, and results of agricultural credit organizations in France.

Relations between cooperative organizations of agricultural producers and of consumers in France, VIMEUX (*Les Relations entre les Coopératives de Production Agricoles et les Coopératives de Consommation en France. Paris: Impr. P. & A. Davy, [1927?]*, pp. 8).—This is a report prepared for the International Economic Conference at Geneva in May, 1927.

The part played by co-operative organisations in the international trade in wheat, dairy produce, and some other agricultural products (*Internat. Labor Off. [Geneva] C. E. I. 14* (1926), pp. 46).—This is a memorandum prepared for the International Economic Conference at Geneva, May 4, 1927. The main study (pp. 5-29) deals with wheat, flour, butter, and cheese, and is divided into three parts, as follows: Agricultural cooperative marketing societies and international trade, distributive cooperative societies and international trade, and international relations between distributive cooperative societies and agricultural cooperative societies. The appendix (pp. 31-46) refers to the part played by cooperative organizations in international commerce in bacon, eggs, fruit, honey, tobacco, natural silk, linen, wool, and cotton.

Financing cooperative marketing associations, G. H. WARD (*Harvard Business Rev.*, 6 (1927), No. 1, pp. 66-73).—The ways available for associations to obtain fixed investment and operating capital are presented and discussed briefly.

Principles of marketing, H. H. MAYNARD, W. C. WEIDLER, and T. N. BECKMAN (*New York: Ronald Press Co.*, 1927, pp. IX+682).—This textbook is intended for an introductory university course covering the principles of marketing and the distributive organization and its functions in the United States. Although the approach to the subject is functional, the authors have planned to include sufficient illustrative material so that a supplemental book of reading will not be necessary. The subject is also considered from the point of view of the consumer.

Economics of motor freight transportation, R. T. WELLS (*Harvard Business Rev.*, 6 (1927), No. 1, pp. 11-19, fig. 1).—Tables are presented and discussed showing the cost per day and mile and the cost per ton mile with full and half loads of 2-, 3.5-, and 5-ton trucks with an average daily mileage of from 20 to 100 miles. Comparisons are made between horse and truck and truck and railroad for different types of hauling.

Control of production of agricultural products by governments: A selected bibliography, compiled by A. M. HANNAY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 23 (1927), pp. [2]+88).—This is a mimeographed selected bibliography of reports, articles, statutes, decrees, orders, etc., arranged alphabetically by commodities. A few references to attempts by private organizations in the United States to control acreage or limit production of staple commodities are included.

Revised index numbers of wholesale prices, 1923 to July, 1927 (*U. S. Dept. Labor, Bur. Labor Statis. Bul.* 453 (1927), pp. III+31).—This is a revision of the index compiled in 1921.⁴ Tables are included giving the revised index numbers of wholesale prices, by months and years, and by groups of commodities, January, 1923, to July, 1927; the index numbers of wholesale prices and purchasing power of the dollar, January, 1923, to July, 1927, by the old and new series; weights and base prices for each commodity used in constructing the revised index; and the wholesale prices of commodities, July, 1923, and June and July, 1927.

The revision consists of (1) the increase in the number of commodities or price series from 404 to 550, (2) a shift of the price base to 1923, and (3) the substitution of more recent "weights" for those heretofore employed.

Explanation of the new index of wholesale prices, E. STEWART (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 25 (1927), No. 6, pp. 46-52).—The chief changes made in the revision of the index numbers of wholesale prices

⁴ Index Numbers of Wholesale Prices in the United States and Foreign Countries. U. S. Dept. Labor, Bur. Labor Statis. Bul. 284 (1921).

of the U. S. Department of Labor, noted above, and the reasons therefor, are discussed.

[**Agricultural statistics for the United Kingdom**] (*United Kingdom Statis. Abs.*, 68 (1908-1922), pp. 88-227, 254-267; 69 (1910-1924), pp. 88-143, 180-193).—These reports continue the series previously noted (E. S. R., 52, p. 395), and give tabulated data on the quantities and value of the principal agricultural products and other articles imported, exported, and transhipped; the average prices by months of British wheat, barley, and oats sold in England and Wales; the acreage of crops and number of livestock in Great Britain; and the estimated total production of the principal crops in Great Britain, Ireland, and the United Kingdom.

[**Investigations in rural sociology at the South Carolina Station, 1926-27**] (*South Carolina Sta. Rpt.* 1927, pp. 81-83).—A study was made in 25 school districts in 4 counties of the amount and use of leisure time by members of rural families over 6 years of age. Records were obtained from 355 white families, of which 284 were owners, and from 44 negro families, of which 8 were owners. The study involved 1,422 white and 153 negro individuals.

It was found that adults have more leisure than they realize, that use of leisure by owners is of a higher order than that by nonowners, that the relationship between spare time activities and the breakdown of individual and group morale is not adequately realized, and that the unwise tendencies and procedures and the mental and physical apathy sometimes exhibited by farm youth are due in part at least to a lack of wholesome "spare time" activities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[**Agricultural research and education in rural economy**] ([*Gt. Brit.*] *Devlpm't. Commrs. Rpt.*, 17 (1926-27), pp. 20-117).—This report for the year ended March 31, 1927, is of the series previously noted (E. S. R., 58, p. 288).

Yearbook of the Agricultural Academy, Dotnava, Lithuania (Dotnava, Lietuva) for 1924-1926 (*Žemės ūkio Akad. [Dotnava, Lithuania] Metraštis*, [1] (1924-1926), pp. 312, pls. 4, figs. 165).—This is the first yearbook of the academy, previously referred to (E. S. R., 57, p. 499).

Projects and the project method in agricultural education, G. A. SCHMIDT (*New York and London: Century Co.*, 1926, pp. [XXIX]+360, pls. 8).—This book is intended as a guide to teachers of vocational agriculture in conducting supervised practice in connection with school activities in agriculture, and supplements that previously noted (E. S. R., 52, p. 404). Besides introductory chapters on tendencies in education and some aspects of vocational education in agriculture, chapters are included on defining the project, the place of the project in the course of study, project values, project selection, project analysis, study, and planning, project accounting, project supervision, types of projects, measuring results, and school records and reports of project work.

Each chapter is followed by a bibliography, and the appendix contains the text of the Smith-Hughes Act and tables for measuring and comparing the relative efficiency of project work in agriculture.

Teaching plans for elementary agriculture, E. C. O'NEAL (*Jefferson City, Mo.: Dept. Ed.*, 1927, pp. 104).—This is a mimeographed series of outlines of lessons for the assistance of teachers in teaching agriculture in the fifth to the eighth grades, inclusive. Each lesson follows the general outline of problem, assignment, instruction, illustrative material, important facts, references, projects, and questions. The program of lessons covers one year's

work, there being 18 lessons on corn and soils for corn, 18 lessons on wheat and soils for wheat, 12 lessons on oats and soils for oats, 24 lessons on sorghums, cotton, and forage crops, and 24 lessons on horticulture and vegetable gardening.

References are given to the U. S. Department of Agriculture Farmers' Bulletins, the Missouri Extension Service and Experiment Station publications, and the Missouri State Board of Agriculture bulletins, and to a few books.

Practical activities in animal husbandry, C. I. BRAY and G. A. SCHMIDT (*New York: Century Co., 1927, pp. XVI+350, figs. 115*).—This is a student's manual planned for use in vocational high school courses in agriculture, special agricultural schools, and agricultural colleges, and includes instruction units on 73 farm "jobs" in handling beef cattle, swine, sheep, horses and mules, and poultry, and in dairying and farm butchering. Each job is presented under the headings of object, explanation, equipment, instructions, and questions for discussion. References are given for each job. A chapter (pp. 315-333) gives suggestions for conducting home projects, and an appendix (pp. 335-350) includes feeding, weight of grains and feeds, gestation, and heat tables, common livestock remedies, and suggestions for taking temperatures of farm animals and judging hay.

The elements of live stock judging, W. W. SMITH (*Philadelphia and London: J. B. Lippincott Co., 1927, pp. VII+147, figs. 82*).—A treatise designed for a beginning course in judging livestock. Of especial interest are the chapters on methods in teaching livestock judging and training livestock judging teams. Other chapters deal with the various classes of livestock. Appended are a glossary, references, and a list of breed associations.

Homemaking, a profession for men and women, E. and F. MACDONALD (*Boston: Marshall Jones Co., 1927, pp. [6]+267*).—This is a textbook for an introductory, or survey, home economics course for college women preparing for business and domestic life.

The high school curriculum in home economics, C. V. GOOD (*Jour. Home Econ., 19 (1927), No. 12, pp. 686-690*).—Tables are given showing (1) the objectives or aims in home economics education as stated by State departments of education and superintendents of schools of the largest cities, (2) the home economics courses offered in 78 junior high schools, and (3) the home economics courses offered in 30 senior high schools.

A ten-year review of home-management extension, 1914-1924, M. J. REESE (*U. S. Dept. Agr. Circ. 17 (1927), pp. 46, figs. 8*).—The development, status, characteristic features, means and agencies used, plans of work, etc., in 1924, and the results of home management extension work, 1914-1924, are discussed. Tables are included showing the number of States and county extension agents reporting demonstrations in home management and home improvement, the number of demonstrations reported in 1924, and the results of such work from 1914 to 1924, inclusive.

FOODS—HUMAN NUTRITION

On the relative nutritive value of various proteins contained in Japanese food articles, U. SUZUKI, Y. MATSUYAMA, and N. HASHIMOTO (*Inst. Phys. and Chem. Research [Tokyo] Sci. Papers, 4 (1925), No. 46, pp. 1-48, figs. 22*).—This is chiefly a compilation from different sources, including studies in the authors' laboratory and others reported in various Japanese journals, of the proximate analyses and nitrogen distribution of the proteins of animal and vegetable materials commonly used as food in Japan and of the nutritive value of these proteins as determined by feeding experiments on young rats. Among the less common food materials included are rice embryos, rice-koji (steamed rice inoculated with *Aspergillus oryzae*), tofu (soy bean curd), polished kaoliang, and various Japanese fish.

The influence of high and low protein diets on blood chemistry, C. C. WANG, J. E. HAWKS, and A. A. WOOD (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 2, pp. 106, 107).—A preliminary report is given of analyses of the blood of 6 normal women, engaged in laboratory work, during a 37-day period in which the protein intake was 2 gm. per kilogram of body weight and a subsequent 30-day period in which the intake was 0.6 gm. per kilogram of body weight. In both periods the diet as a whole furnished 40 calories per kilogram of body weight. The blood analyses were made 4 days each week.

In three subjects the blood sugar was higher on the low protein diet and in the other three remained the same on both diets. Minimum and maximum values were 80.9 and 86.9 mg. per 100 cc. of blood on the high protein diet and 88.5 and 91.6 on the low. Lactic acid was higher on the low protein diet, the range being from 11.1 to 20.7 mg. per 100 cc. on the high protein and from 18.1 to 29.4 on the low protein diet. Both the total nonprotein and urea nitrogen were abnormally high on the high protein diet. The values on the low protein diet were within normal range, 27.5 to 31.8 mg. per 100 cc. of blood for the total nonprotein nitrogen and 9 to 10.9 for the urea nitrogen. Corresponding figures for the high protein diet were 37 to 57.2 and 13 to 20.6 mg., respectively. Four of the subjects showed a slight rise in uric acid and the other two no change during the high protein diet, the values ranging from 2.9 to 4.8 mg. as compared with 3.1 to 3.9 mg. on the low protein diet. Creatinine values were remarkably constant for all subjects on both diets, averaging 1.4 mg. per 100 cc. Creatine, while constant on the same diet, was much higher on the high than on the low protein diet.

Place of the banana in the diet of children, J. A. JOHNSTON (*Jour. Amer. Dietet. Assoc.*, 3 (1927), No. 2, pp. 93-97).—Observations are reported on the use of bananas to the extent of 40 per cent of the calories in the diet of babies and older children, and in the treatment of scurvy, as noted by Eddy and Kellogg (*E. S. R.*, 56, p. 894), and of cellac disease.

The effect of heat treatment of skim milk upon the baking quality of the evaporated and dried products, G. R. GREENBANK, M. C. STEINBARGER, E. F. DEYSHER, and G. E. HOLM (*Jour. Dairy Sci.*, 10 (1927), No. 4, pp. 335-342, figs. 3).—Two commercial samples of dry skim milk were selected by the U. S. D. A. Bureau of Dairy Industry to determine the effect of previous heating of the milk upon the property of a bread dough mix in baking. The samples were known to have received different heat treatments before being reduced to a dry state. Dry skim milk which had received a high heat treatment (No. 2) seemed to impart to the dough a greater water-holding capacity than the milk which had received a lower heat treatment (No. 1). The use of sample 1 showed no beneficial effect over the check loaf except to increase the weight, and there also seemed to be a slight binding effect from its use. Sample 2 materially increased the volume of the loaf, though there was little difference in the weight of the two loaves. There is evidence that the temperature to which milk is subjected in manufacturing is not sufficiently great to coagulate the albumin.

Studies in phosphorus and calcium metabolism on deficient diets, I-III [trans. title], P. SCHULTZ (*Biochem. Ztschr.*, 188 (1927), No. 4-6, pp. 409-447).—An investigation of the calcium and phosphorus metabolism of young rats as influenced by diet and ultra-violet treatment is reported as follows:

I. The influence of ultra-violet light (pp. 409-426).—In this study four different diets were used: (1) A nonrachitic low-phosphorus diet, (2) a rachitic low-phosphorus diet (McCollum 3148), (3) a rachitic low-calcium diet (a modification of the preceding diet), and (4) a nonrachitic diet with suitable proportions of calcium and phosphorus. The retention of calcium and

phosphorus was determined for each of these diets with and without ultra-violet therapy.

On the first diet both the control and light-treated groups lost weight, but the phosphorus retention was slightly higher in the treated than the untreated rats. On the second diet ultra-violet treatment increased the retention of both phosphorus and calcium, the difference being in the amounts of these elements excreted in the feces. This indicated that the effect of the treatment was to induce greater absorption of both calcium and phosphorus. The treatment, which was continued for 12 days, brought about healing of rickets and raised the acid-soluble phosphorus of the blood to a normal level and the serum calcium to values above normal. On the rachitic low-calcium diet the phosphorus and calcium retention before treatment was very low and even after irradiation did not reach normal values. The serum calcium and acid-soluble phosphorus were raised to normal by the treatment. Ultra-violet treatment had no effect on the calcium and phosphorus metabolism on the fourth diet in which the proportions of calcium and phosphorus were satisfactory.

II. *The influence of cod-liver oil* (pp. 427-434).—In this repetition of the last three parts of the first study with cod-liver oil treatment in place of ultra-violet light, similar results were obtained.

III. *Alterations in the phosphorus and calcium content of the diet* (pp. 435-447).—The first two diets used in this study consisted of the McCollum rachitic diet 3143 for the fore period and for the after period the same diet altered by the addition of phosphate and the removal of calcium, the percentages of calcium and phosphorus in the two diets being 0.6 and 1.14 and 0.265 and 0.491 per cent, respectively. In the third series the diet for the fore period was diet 3143 modified by the reduction of the calcium carbonate by one-half and in the after period the unmodified diet.

The addition of the phosphates to the calcium-rich and phosphorus-deficient diet increased the retention of both calcium and phosphorus, the former through lowered output in the urine and the latter through greater absorption. Healing of rickets and an increase in the acid-soluble phosphorus of the blood to normal values also took place, but with no change in serum calcium. Similar results were obtained through lowering the calcium carbonate, except that the retention of calcium, as well as phosphorus, was due to greater absorption. The change in the modified nonrachitic to rachitic diet lowered the phosphorus retention through greater output in the feces, induced rickets, and lowered the acid-soluble phosphorus of the blood, but had no effect on the serum calcium.

Studies of inorganic salt metabolism.—I, The ward routine and methods, W. BAUER and J. C. AUB (*Jour. Amer. Dietet. Assoc.*, 3 (1927), No. 2, pp. 106-115).—A detailed description is given of the routine which has been developed in the special study ward of the Massachusetts General Hospital for the study of calcium and phosphorus metabolism. Two specimen low calcium diets are given, together with a tabulation of the calcium and phosphorus content of all of the foods used as analyzed in the hospital laboratories, and wherever possible of figures for the same materials taken from other sources. Figures for calcium not hitherto reported are as follows:

Milk-free bread, 0.011, chicken (white meat) 0.016, chicken (dark meat) 0.02, Graham crackers 0.025, Uneda crackers 0.022, ginger ale 0.0006 and 0.0005, ham 0.022, lactose 0.004, liver, 0.006, low calcium fudge 0.003, steamed potato 0.011, cooked rice 0.006, round lean steak 0.008, canned tomatoes 0.005, turkey 0.008, goose 0.012, cranberries 0.013, Klim 0.996, and Vegex 0.019 per cent. New figures for phosphorus are broiled bacon 0.006, milk-free bread 0.082, chicken

(white meat) 0.164, chicken (dark meat) 0.158, Graham crackers 0.111, ginger ale 0.001, lactose 0.004, liver 0.275, low calcium fudge 0.008, steamed potato 0.0475, cooked rice 0.075, fat round steak 0.172, lean round steak 0.172, canned tomatoes 0.042, turkey 0.212, and Vegex 1.17 per cent.

Studies in gastric digestion.—The relation of volume, hydrogen ion concentration, and buffer capacity of the test meal to gastric contents, W. A. STANDISH, G. R. COWGILL, and A. T. SHOHL (*Amer. Jour. Physiol.*, 81 (1927), No. 3, pp. 696-706, fig. 1).—Using the methods of determining the H-ion concentration and the buffer values of gastric contents described by Shohl and King (*E. S. R.*, 44, p. 505), the authors have determined the volume, pH, and buffer capacity of the residue in the stomachs of dogs at definite times after known meals of varying amounts and concentrations. Two dogs with gastric fistulas were used, and the test meals consisted of the dried milk preparation Dryco dissolved in varying amounts of distilled water. The results obtained are summarized as follows:

"The amount of gastric juice secreted is sufficient to increase the pH between 4.1 and 3.9 for all meals. Therefore, the amount of HCl secreted depends directly upon the volume and concentration of the meal. The pH of the stomach contents tends to remain nearly constant until the end of digestion. Concentrated meals and meals of large volume take longer for digestion than small and dilute meals. The motility of the stomach, therefore, varies directly with the volume and concentration of the meal. A given meal is most rapidly digested when it is concentrated in small volume.

"The buffer capacity of the gastric contents, after an initial increase, stays fairly constant. Large buffer capacities, associated with relatively large volumes of contents, indicate the beginning of digestion; small buffer capacities in small volumes of contents signify the end of digestion. The effect of concentration is important and quantitatively measurable, not only upon secretion, but also upon motility."

The effect of diet upon reproduction, D. MACOMBER (*Jour. Amer. Dietet. Assoc.*, 3 (1927), No. 2, pp. 57-67).—In this paper, read before the Massachusetts Dietetic Association, February 8, 1927, the author summarizes briefly the literature on the effect of dietary deficiencies in protein, mineral elements, and vitamins on the reproductive processes, and discusses what should be included in a normal balanced diet from the point of view of reproduction.

In his opinion such a diet should include meat once a day as a source of animal protein and iron; sea fish once or twice a week to supplement the meat proteins and to supply iodine; one egg a day for its protein, fat-soluble vitamins, and iron; from two to four glasses of milk daily for protein, calcium, phosphorus, and vitamins; fresh fruits once a day as a source of vitamin C; liberal amounts of butter for vitamin A; and some whole grain cereals for vitamin B. In addition there should be liberal amounts of leafy vegetables, some one of which should be eaten raw, and occasionally root vegetables, seeds such as peas and beans, and nuts. Modifications of such a diet for overweight and underweight subjects are discussed.

Vitamins A and B in the Chinese litchi nut, A. H. SMITH and P. P. T. SAH (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 1, pp. 63, 64).—The edible portion of the Chinese litchi nut in 1 and 2 gm. daily doses proved entirely ineffective as a source of either vitamin A or vitamin B in curative tests on young rats.

The composite nature of vitamin B, R. R. WILLIAMS and R. E. WATERMAN (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 1, pp. 1-3).—In this preliminary report the authors summarize briefly the results they have obtained in a comparison of the effects on adult pigeons and young rats of various yeast preparations used as supplements to the Sherman-Spohn basal vitamin B-free diet

(E. S. R., 51, p. 368). The yeast preparations included (1) an aqueous extract of brewers' yeast, (2) fuller's earth activated with the same extract with interposition of a collodion membrane, and (3) brewers' yeast autoclaved for 6 hours at 125° C.

Pigeons on the synthetic diet without supplement declined in weight to from 60 to 70 per cent of normal and died of polyneuritis in 30 or 40 days. When the diet was supplemented by from 0.2 to 0.4 gm. of the yeast extract, by 0.01 gm. of activated fuller's earth, or by 0.01 gm. of activated fuller's earth plus 1 gm. of autoclaved yeast, the pigeons showed slight loss in weight and a slight defection but were otherwise healthy. Young rats receiving no supplement lost weight rapidly and died of polyneuritis. On the basal diet supplemented with 0.03 gm. of yeast extract plus 1 gm. of autoclaved yeast or with 0.01 gm. of activated fuller's earth plus 1 gm. of autoclaved yeast, growth was normal. With 0.01 gm. of activated fuller's earth as the supplement, there was slow growth at first, followed by a decline of several weeks' duration, and with 1 gm. of autoclaved yeast as supplement there was slight growth, followed by decline, polyneuritis, and death. A repetition of the same experiments with pigeons, substituting polished rice for the synthetic diet, gave essentially the same results except that the birds receiving no supplement died sooner.

These results are thought to confirm the conclusion of previous workers as reviewed by Chick and Roscoe (E. S. R., 57, p. 789) that rats require the heat-labile and heat-stable factors of vitamin B [vitamins F and G], and that of Seldell (E. S. R., 56, p. 203) that the heat-stable factor [vitamin G] is not necessary for the well-being of adult pigeons. The failure of pigeons to maintain normal weight on a diet supporting normal growth in rats is thought to suggest the possibility of a third factor essential for pigeons but not for rats.

Vitamin B testing revised, W. H. Eddy (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 2, pp. 125-127).—In this preliminary note the author reports the results he has obtained in testing banana and spinach for the antineuritic and antipellagric factors [vitamins F and G], using autoclaved yeast as a supplementary source of vitamin G and the Williams-Waterman activated fuller's earth fraction noted above as the supplementary source of vitamin F in the Sherman-Spoln technique for vitamin B determinations (E. S. R., 51, p. 368).

With 5 mg. daily of the Williams-Waterman preparation, 2 gm. of ripe banana daily proved sufficient to produce a gain in weight of 20 gm. in 60 days as compared with 8 to 10 gm. of banana previously found necessary as the sole source of vitamin B (E. S. R., 56, p. 894). With autoclaved yeast as the supplement, at least 6 gm. of banana daily was required to prevent decline in weight, thus showing that the banana is much richer in vitamin G than in F. In the spinach tests 2 gm. daily of undried cooked spinach supplemented with 5 gm. daily of the vitamin F preparation produced nearly normal growth and with 0.5 gm. of the vitamin G preparation prevented decline in weight but did not induce growth, showing that the cooked spinach is also richer in vitamin G than in F.

Further evidence of destruction of vitamin B in evaporated milk, A. L. DANIELS and L. BROOKS (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 3, pp. 161-163).—In an attempt to discover whether the unfavorable symptoms reported by Hartwell (E. S. R., 53, p. 766) as occurring in suckling rats whose mothers received evaporated milk as the source of vitamin B might be the result of a calcium deficiency in the evaporated milk (E. S. R., 44, p. 860), it was found that neither the addition of calcium phosphate or cod-liver oil to the evaporated milk nor the substitution of irradiated for ordinary evaporated milk modified the symptoms in the young. The addition of wheat

embryo extract to the evaporated milk ration or the substitution of quickly-boiled for evaporated milk prevented the symptoms. This observation, together with the development of polyneuritis in pigeons fed polished rice supplemented with 25 cc. of evaporated milk, has led to the conclusion that in the exaporation of milk the antineuritic vitamin F is destroyed. Attention is called to the observation of Sherman and Axtmayer (E. S. R., 58, p. 295) and Chick and Roscoe (E. S. R., 57, p. 789) that vitamin F is less abundant than vitamin G in milk.

The chemical composition of the bones of scorbutic guinea pigs [trans. title], E. BROUWER (*Biochem. Ztschr.*, 190 (1927), No. 4-6, pp. 402-410).—Following a critical discussion of the somewhat conflicting literature on the composition of the bones in scurvy, the author reports a series of experiments in which pairs of guinea pigs from the same litters and fed the same amount of the basal ration with the addition for one of each pair of 1 or 2 gm. daily of fresh grass (E. S. R., 58, p. 90) were used for bone analyses. The healthy animals were killed when the corresponding scorbutic ones died. The analyses were made on the tibias dried at 105° C., CaO being determined gravimetrically and P₂O₅ by the Bell-Doisy-Briggs method.

The average results obtained for the scorbutic and healthy animals of four pairs were, respectively, as follows: Dry substance 45.8 and 56.2 per cent, ash in percentage of total weight 24.3 and 26.9, ash in percentage of dry substance 53.2 and 47.9, CaO in percentage of dry substance 28.2 and 25.4, CaO in percentage of ash 53.1 and 53.1, P₂O₅ in percentage of dry substance 22.6 and 20.3, and P₂O₅ in percentage of ash 42.5 and 42.5 per cent. These results thus show a decrease in total ash and dry substance, but no change in the relation of CaO to P₂O₅. The same calcium-phosphorus ratio was obtained when the basal ration was supplemented with 0.5 gm. daily of cod-liver oil.

The author concludes that the brittleness of scorbutic bones is due not to a deficiency in calcium and phosphorus but to an alteration in the microscopic structure.

The diabetic diet, E. P. JOSLIN (*Jour. Amer. Dietet. Assoc.*, 3 (1927), No. 2, pp. 89-92).—Coma, resulting from increased metabolism, and arteriosclerosis, the outcome of excessive cholesterol in the blood, are given as the present causes of death from diabetes. In the author's opinion both of these may be prevented by proper diet. The optimal diet for the average diabetic patient, with or without the help of insulin, is said to contain 100 gm. of carbohydrate, 75 of protein, and 125 of fat.

Adjusting the diet to the patient with pernicious anemia, T. TUBBS and E. BELLINGER (*Jour. Amer. Dietet. Assoc.*, 3 (1927), No. 1, pp. 7-13).—The standard diet used at the Peter Bent Brigham Hospital at Boston, Mass., in the treatment of pernicious anemia by the Minot-Murphy method is described, together with sample menus for a preliminary full liver but low caloric diet, full diets with cooked and raw liver, a fairly low caloric diet with raw liver pulp, and a full diet with liver specially prepared for those who find it difficult to take. Directions are given for the preparation of liver pulp, scraped or sieved liver, and liver stuffed in green peppers or tomatoes. It is stated that the prescribed amount of liver should be taken whatever else is omitted from the diet, that fruits and vegetables should be given the next consideration, followed by muscle meat (beef, mutton, and lamb), with bread, potatoes, and simple desserts used merely to appease the appetite.

The total energy requirement of the albino rat for growth and activity, F. A. HITCHCOCK (*Amer. Jour. Physiol.*, 83 (1927), No. 1, pp. 28-36, figs. 3).—To determine the cost in calories of the additional growth of young rats receiving meat in addition to a well-balanced diet (E. S. R., 56, p. 590), the

relation of food consumption to the rate of growth and bodily activity was determined for rats on the diet previously described, with and without meat. Three series of determinations were made: (1) The total food consumed by nursing mothers and their litters during the first 30 days of life of the litters, (2) the total food consumed by the young rats from weaning at 30 days until 90 days of age, and (3) the total food consumption of adult rats in activity cages. In the last-named series, a low protein group was studied in addition to the control and meat-fed groups. The first group consisted of 25 litters, 14 of which, containing 100 young, were in the meat-fed and the remaining 11 litters, with 81 young, in the control group. In the second series 25 males and 31 females of the first group and 25 males and 30 females of the second group were continued on the respective diets, and in the third series 24 animals on which 49 determinations were made received meat, 30 animals on which 54 determinations were made were on the control diet, and 8 with 23 determinations on the low protein diet.

In the first series the meat-fed group consumed 10.6 calories and the control group 11.5 calories for every gram increase in weight of the young. Deducting from the total food consumption 15,687 calories for the maintenance of the mothers in the meat-fed group and 11,857 calories for the control mothers, it was estimated that 43,155 calories were available for milk production in the meat-fed group and 25,800 calories for the control group. It was also computed that the meat-fed rats consumed 4,197 and the control rats 4,271 calories in totaling their birth weight.

During the period from 30 to 90 days of age the caloric cost of a gram increase in weight was shown to be inversely proportional to the square root of the percentage increase in weight. In adult rats kept in activity cages the increase in food consumption brought about by increased activity was found to be directly proportional to the cube root of the activity expressed in meters. It was computed that a completely inactive rat would consume approximately 855 calories per square meter of body surface.

TEXTILES AND CLOTHING

Textile fabrics, G. H. JOHNSON (*New York and London: Harper & Bros., 1927, pp. XXVI+385, figs. 176*).—This book treats of textile fabrics from the viewpoint of use, wear, and laundering, giving practical discussions of the characteristics of the several textile fibers; weaving and wear; the fabrics usually met in the power laundry; bleaching, dyeing, and finishing during manufacture; the sources of damage to textiles; textile testing; and the conservation of textiles.

The effects of atmospheric factors on fiber materials [trans. title], H. SOMMER (*Leipzig. Monatschr. Textil Indus., 42 (1927), Nos. 1, pp. 35-38, figs. 3; 2, pp. 96-100, figs. 4; 3, pp. 158-162, figs. 11; 4, pp. 206-211, figs. 4*).—Experiments involved the effects of light (E. S. R., 54, p. 394), acid, alkalis, and other atmospheric factors and gases on the durability of variously treated fabrics. When sensitivity to weather conditions was estimated by the number of sunshine hours of exposure required to reduce the original strength of the fabric to about one-half, the different fibers ranked as follows: Silk 200, jute 400, rayon 900, cotton 940, linen 990, hemp 1,100, raw wool 1,120, and chrome wool 1,900. Exposure was generally accompanied by a progressive loss of strength, and damage was greater in air contaminated by smoke, etc., than in pure air. Weather damage seemed due to an interaction on the exposed surface of the cloth, caused by ultra-violet and other short waves of light and promoted by the presence of moisture.

Twist testing and twist-testing appliances (*Textile Recorder*, 44 (1926), No. 522, pp. 46, 47; 44 (1927), No. 528, pp. 53, 55, figs. 6; 45 (1927), No. 533, pp. 53, 54, 57, fig. 1).—A practical discussion of the value and technique of testing the twist of yarns, with descriptions and illustrations of twist-testing apparatus.

The cotton world, compiled and edited by J. A. TOMB (*London and New York: Isaac Pitman & Sons*, 1927, pp. VIII+236, pls. 3).—Based on lectures at the City School of Commerce, Liverpool, this book deals with the world's cotton supplies, the Liverpool cotton market, the Lancashire cotton industry, the world's consumption of cotton and cotton goods, and cotton trade and research organizations.

The geographical basis of the Lancashire cotton industry, H. W. OGDEN (*Jour. Textile Inst.*, 18 (1927), No. 11, pp. T573-T594, pls. 2, figs. 18).—This study suggests that the cotton industry of southeast Lancashire is based on the geographical structure of the area, with the plentiful soft water supply fairly evenly distributed over the year, plentiful rainfall in every month and a warm, moist atmosphere, and a natural gateway through the Mersey estuary to cotton fields and to consumers of finished fabrics.

Notes on the effect of light on coloured cotton fabric, E. HIBBERT (*Jour. Soc. Dyers and Colourists*, 43 (1927), No. 9, pp. 292-294, fig. 1).—The color of pieces of calico dyed with direct colors and exposed to light in Manchester for 6 months was almost completely destroyed in each case, the color being destroyed long before the calico had acquired the copper number 3.6. The tensile strength of unexposed fabric dyed with duranthrene yellow was 48 lbs., cibacron yellow 46 lbs., and indigo 46 lbs., whereas after exposure for 120 hours in a fadeometer the respective strengths were 27, 16, and 22 lbs. The behavior of indigo dye on calico is discussed briefly.

The dyeing of neps, L. G. LAWRIE (*Jour. Soc. Dyers and Colourists*, 43 (1927), No. 9, pp. 294, 295, fig. 1).—Consideration of the problem gave indications that the differences in appearance between neps and the normal cotton fiber are not merely due to differences in light reflection from flat surfaces. Differences in shade seemed due to the fact that with normal cotton fibers the secondary thickening is most highly colored, while with neps the cuticle only or a lesser amount of secondary thickening can be dyed. Certain dyestuffs listed are apparently able to dye the cuticle to a greater extent than others, and the differences in shade between the neps and the normal fiber can probably be minimized by their use.

The effect of subjecting cotton to repeated blow-room treatment, A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul.* 10 (1927), pp. [2]+23, fig. 1).—Lots of three standard Indian cottons containing a high percentage of foreign matter were given, respectively, two, three, and four treatments in the Crighton opener. One sort received the two normal opener treatments but passed through the scutcher three, four, and five times, respectively, and then each lot was spun into three counts of yarn and subjected to spinning and yarn tests.

An increase of only about 0.75 per cent in total waste resulted from each additional treatment in the opener, while practically no difference was noted in spinning behavior or appearance or strength of yarn. Additional scutching gave similar effects. It is concluded that so long as the cotton passes uniformly through the blow room repeated opening or scutching slightly improves cleaning without detriment to yarn strength, and that once cotton containing foreign matter is baled it may be very difficult, if not impossible, to remove the foreign matter completely, especially fragments of seed coat, and the appearance and value of the yarn suffer accordingly.

The value of sisal hemp for the manufacture of marine cordage (*Bul. Imp. Inst. [London]*, 25 (1927), No. 4, pp. 359-368).—An experiment noted earlier (*E. S. R.*, 58, p. 197) is reported on in greater detail. The test results indi-

cated that East African sisal hemp of No. 1 quality withstands the action of sea water as well as or even better than J grade manila hemp, whereas East African sisal hemp of No. 2 quality is slightly inferior in this respect to manila hemp. When immersed in water the manila rope did not increase in girth so much as the sisal ropes, being superior to sisal in this respect. Sisal fiber was found to sink far more rapidly in water than manila hemp.

Bibliography on wool, M. R. WHALLEY (*Ottawa: Natl. Research Council, 1927, pp. 174*).—The references, many of which are annotated, in this mimeographed publication are grouped as to general articles and bulletins, statistical publications, and textbooks under the general headings of Sheep Breeding and Raising and The Wool Textile Industry.

Selecting representative wool samples for accurate shrinkage tests, J. M. JONES and J. L. LUSH (*Sheep and Goat Raisers' Mag., 7 (1927), No. 12, pp. 31, 33*).—Scouring studies on fleeces from high-grade Rambouillet sheep at the Texas Ranch Substation showed that 25 fleeces from sheep impartially chosen will have a shrinkage practically within 2 per cent of the true shrinkage of the entire group sampled, and similarly the shrinkage of 100 fleeces will have a shrinkage within 1 per cent of the true shrinkage. On about 900 samples aggregating 38,000 lbs. and scoured during 7 years for producers in 51 Texas counties, an average shrinkage of 60.54 per cent was obtained.

The effect of sunlight on wool (*Textile Recorder, 44 (1927), No. 528, pp. 67-69, figs. 3*).—Recent investigations on the effect of sunlight on different kinds of dyed and undyed wool and wool yarn are reviewed.

Frictional heat tester, BOWDON (*Textile Recorder, 45 (1928), No. 538, p. 53, figs. 4*).—An instrument designed by J. W. Warburton at the Bradford, England, Technical College demonstrated that with wool fibers the frictional heat increases with an increase in the quality of the material. This tendency seemed due to the fact that in a low quality wool the epidermal scales are large and comparatively few.

The identification of dyestuffs on cellulose acetate, C. M. KEYWORTH (*Jour. Soc. Dyers and Colourists, 43 (1927), No. 11, pp. 343-361*).—The reactions of each of 220 dyestuffs on cellulose acetate rayon to 13 reagents are tabulated, with a discussion of technique.

Cleaning of fur and leather garments, M. H. GOLDMAN and O. C. HUBBARD (*U. S. Dept. Com., Bur. Standards Technol. Paper 360 (1927), pp. 183-197, figs. 2*).—A method devised for thoroughly cleaning fur and leather garments and still retaining the fat-liquor content essential to appearance and pliability involves modification of the usual dry cleaning process by the addition of small percentages of paraffin. Standard practices are outlined for preparation of paraffin-naphtha liquor and for cleaning white fur, colored fur, fur-trimmed and leather garments, and white and colored gloves.

MISCELLANEOUS

List of publications of the United States Department of Agriculture from January, 1901, to December, 1925, inclusive, compiled by M. G. HUNT (*U. S. Dept. Agr., Misc. Pub. 9 (1927), pp. V+182*).—This supplements the list previously noted (*E. S. R., 14, p. 408*).

Fortieth Annual Report of the South Carolina Experiment Station, [1927], H. W. BARRE (*South Carolina Sta. Rpt. 1927, pp. 106, figs. 34*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and a report of the work of the station during the year. The experimental features reported not previously noted are for the most part abstracted elsewhere in this issue.

NOTES

Alabama Polytechnic Institute.—Dr. Bradford Knapp, president of the Oklahoma College, has been appointed president, beginning June 1.

Arkansas Station.—A new dairy barn is under construction at the station. A farm laborer's cottage and a sheep barn were recently completed.

California University and Station.—H. B. Walker, head of the department of agricultural engineering at the Kansas College, has accepted an appointment as professor of agricultural engineering and agricultural engineer in the station, effective July 1, and with headquarters at the University Farm, Davis.

Delaware Station.—H. G. Butler, assistant entomologist in the Indiana Station, has been appointed assistant entomologist, effective April 1.

Georgia College.—A recent statement from the college announces "the establishment within the institution of the Experiment Station of the Georgia State College of Agriculture. The experimental division of the institution will coordinate the investigational activities already in progress, and is adding six new members whose whole time will be given to the study of problems vital to the agriculture of Georgia.

"The support of this division comes entirely from the funds of the State of Georgia and it is an integral part of the Georgia State College of Agriculture, the control of the same being in the hands of a committee on research, of which the president, Dr. Andrew M. Soule, is chairman. The general supervision and responsibility for the coordination of effort is placed in the hands of a secretary of the research committee, who is appointed by the board of trustees." To this position of secretary Dr. T. H. McHatton, professor of horticulture, has been appointed.

Idaho University and Station.—Following the return from leave of absence of Dean and Director E. J. Iddings, Dr. C. W. Hungerford, acting dean and director, has been appointed assistant dean of the College of Agriculture and vice director of the station.

Purdue University and Station.—Ground was broken March 15 by O. B. Zimmerman, president of the American Society of Agricultural Engineers, for the \$76,000 station unit of the new agricultural engineering building. This unit will house the staffs of the station and extension departments in this subject and provide five laboratories for investigational work. Three of these laboratories have been assigned to farm machinery, farm electricity, and domestic engineering. One feature is the historical room, set aside to preserve for reference important experimental phases in the development of agricultural equipment. The front part of the unit is 44 by 60 ft. in size and three stories high, while the laboratory in the rear is 52 by 120 ft. All the laboratories are to be finished in glazed tile and will be of fireproof construction throughout.

E. R. Lancashire, specialist in extension horticultural work, resigned January 31 to take up similar work at Ohio State University and was succeeded February 1 by Willard B. Ward of the department of horticulture and forestry of the Iowa College. P. G. Riley and E. D. Griffin, extension poultry specialists, have resigned to accept commercial positions. Nelle K. Flaningham, extension specialist in millinery, and Flora E. Miller, extension nutrition specialist, resigned February 15 and 20, respectively.

Michigan College and Station.—The *M. S. C. Record* notes that C. M. Ferguson, assistant professor of poultry husbandry, and C. E. Cormany, research associate in farm crops, have resigned to participate in the establishment of an agricultural experiment station in Colombia, as the nucleus of the first agricultural college in that country.

Attendance records for the 1928 Farmer's Week are said to have been broken with an estimated aggregate of 10,000 men and women.

Minnesota University and Station.—A cold temperature laboratory has been constructed for the division of plant pathology and botany. This laboratory contains four rooms each 10 ft. square and 9½ ft. high, of concrete block construction, and with cork insulation 1 ft. thick. The rooms will be held at temperatures of 32, 14, -4, and -58° F., respectively, each being under separate temperature control. It is believed that this equipment will provide unequaled facilities for the study of winter hardiness and cold resistance of plants.

Otto G. Schaefer, associate professor of dairy husbandry and dairy husbandman, has resigned to engage in commercial work. Dr. R. E. Lubbehusen resigned March 1 as assistant veterinary pathologist in the station to accept a position with the bureau of animal industry of the Pennsylvania State Department of Agriculture.

Montana College and Station.—R. A. Cooley, head of the department of entomology and State entomologist, has been given a year's leave of absence, of which a part is to be spent in a study of tick parasites in mid-Africa.

Nebraska University and Station.—Following more than a year of service as acting chancellor, Dr. E. A. Burnett has been appointed chancellor of the university for the period from March 1, 1928, to June 30, 1929. W. W. Burr, chairman of the department of agronomy and acting director of the station, has been appointed associate dean of the College of Agriculture and director of the station, and will have charge of the agricultural work during this period.

A new range of greenhouses, with a total ground area of 6,800 sq. ft., has been erected. The range includes three separate houses, two 28 by 100 ft. each and one somewhat smaller. The larger houses will each be divided into three sections, each of which may be kept at a temperature not varying over 1° F. The third house will be used to study the relation of representative Nebraska climate to the recent alfalfa failures in the central and western parts of the State. A service house 20 by 75 ft. is built along the ends of the greenhouses, the main floor containing office, laboratory, and refrigeration rooms, and the basement refrigeration machinery, a storage refrigerator, soil bins, etc. The houses will also contain an insect room fitted up with insect-proof windows, doors, floor, and tables and a soil sterilizer.

Rutgers University and New Jersey Stations.—A. J. Farley, college and station pomologist, has been appointed extension pomologist, beginning February 1. M. A. Blake, chief of the division of horticulture, will, with additional assistance, assume for the present the duties of station pomologist.

Pennsylvania College and Station.—Dr. S. W. Fletcher, head of the department of horticulture, has been appointed vice dean and director of research in agriculture.

Louise B. Moss, associate professor of home economics, died February 2. She had been associated with home economics instruction of the college since 1918.

South Carolina Station.—Definite cooperation with the United States Department of Agriculture has been begun at the new Sand Hill Station near Columbia.

In the home economics research work, definite progress is reported in a study of the dietary habits of rural children from one to six years of age. Food histories have been obtained and examinations made in approximately 300 cases. There is shown to be a rather clearly divided relationship between the physical condition of the children as revealed by the examination and the food habits as recorded by the investigator.

Because of the development of so many important facts in connection with the project on the mineral content of several farm-grown roughages in relation to the mineral content of the soil, another and more restricted study has been initiated. As a separate project the factors influencing the iodine content of food and feeds are being studied, with analyses of a number of plants, foods, feeds, fertilizers, air samples, soils, and waters.

Vermont University and Station.—Dean and Director J. L. Hills began on March 12 his forty-first year of continuous service for the institution. His original appointment was as chemist in the station, but he has been director since 1893 and dean of the College of Agriculture since 1898. The agricultural staff has increased during this period from 3 to over 50 members, and the student body, appropriations, and equipment in even greater proportions.

Washington College and Station.—The departments of farm crops and soils were consolidated February 1 into the new department of agronomy in the college and division of agronomy in the station. E. G. Schafer, head of the department of farm crops and agronomist, will serve as head of the new department. Dr. S. C. Vandecaveye, head of the division of bacteriology of the station, has been appointed professor of soils in the college and soil bacteriologist in the station and will be in charge of the soil section of the department.

Agricultural Education and Research in Haiti.—The following notes are made available through the courtesy of Dr. G. F. Freeman, Director General of Agriculture in the Technical Service of the Department of Agriculture and Professional Education, under which agricultural education and research in Haiti is organized.

As regards agricultural education, there is a central normal school for the training of teachers, and a system of rural agricultural schools is being developed. Fifty such schools are now in operation, each of which consists of a masonry building of one or two rooms and a shop building surrounded by a school garden varying in size from 1 to 20 acres. The schools have from 30 to 150 students and from one to three teachers according to the number of students. In the cities a system of industrial schools is being developed.

For extension work there are 10 farm advisors located in as many districts. These men devote their entire time to the organization of community projects and to the management of a system of demonstration farms. In addition, there are 9 veterinarians who hold free clinics in the rural centers. A unit for the demonstration of control methods for insect pests and plant diseases is also kept in the field a great part of the time.

The experiment station system consists of a central station of approximately 200 acres located near Port au Prince, a coffee station, and a livestock station. At the central station experimental work with citrus and other tropical fruits and vegetables is carried on, as well as work with cotton, sugar cane, and the feed and food crops ordinarily grown in field cultures. The station operates a model dairy, and is undertaking work in the breeding of poultry, hogs, and other livestock.

The coffee station, containing about 100 acres, is located in the mountains about 70 miles southwest of Port au Prince. Here experimental work with coffee, cocoa, and rubber is being undertaken.

The livestock station, located at Hinche in the central plains area, contains about 1,500 acres of prairie and hill lands. It is endeavoring to develop a system of agriculture and cattle raising adapted to the section.

Forestry and fisheries are also administered by the Technical Service. A forestry law has been passed which provides for the creation and administration of national forests, and under this law an area of about 30,000 acres has been set apart as the San Raphael National Forest. A forest experiment station of 300 acres is located near Port au Prince in the Cul de Sac Plain, and another station of approximately 1,500 acres is in the Plain du Nord near Cape Haitien. The former station is being used for experiments with sisal, and the latter is being developed for the study of practical reforestation and the culture of logwood and other tropical forest products and the relation of such culture to cattle and goat raising.

New Journals.—*Journal of the Council for Scientific and Industrial Research* is being published quarterly as "a means of disseminating general information as to Australia's scientific problems and as to scientific research work in progress throughout the Commonwealth." The initial number contains articles entitled Science and the Nation, by S. M. Bruce, Prime Minister of Australia; Science and Labour, by M. Charlton of the Commonwealth Parliament; The Council for Scientific and Industrial Research: Its Organization and Work, by G. F. Pearce; The Commonwealth and Agricultural Research, by A. E. V. Richardson; Animal Nutrition Problems, by T. B. Robertson; Co-operative Research in the Wool Industry; The Australian Meat Industry: The Economic Importance of the Satisfactory Freezing of Beef; and The Biological Control of Prickly Pear, by A. P. Dodd; together with a number of brief notes.

Trudi Sil's'ko-Gospodars'koï Botaniki (Journal of Agricultural Botany) is being published by the Botanical Section of the Agricultural Scientific Committee of the Ukraine. The initial number contains numerous original articles, to many of which English or German abstracts are appended. Among these are Different Sorts of Winter Wheat in the Shewtshenko District, by D. Litovkin (Litowkin); The Length and Coloring of the Coleoptile in Different Wheats, by M. Prikhod'ko (Priehodjko); The Transformation of the Kernel Cell during the Process of Hereditary Variability, by L. Delone (L. N. Delaunay); Characteristics of *Andropogon sorghum sudanensis* Piper, by S. Voroblov (Voroblev); *Cicer arietinum* in the Agriculture of the Ukraine, by A. (J.) Savchenko; "Virginia" Tobacco, by M. Rens'kil (Ranski); and The Rapid Determination of the Germinability of Grain, by O. A. nata (A. Junata).

Revue Technique du Monopole des Tabacs de Turquie is being published by the Section of Technical Agriculture of Turkey. The more important articles are printed in French. Among those in the initial number are an account of the programs of the Bureau for the Study, Improvement, and Protection of Tobacco, and articles entitled A Dangerous Enemy of Leaf and Manufactured Tobacco: *Lasioderma serricorne*, by O. Perrin and N. Remzi; Production of Tobacco Plants in Beds, by O. Perrin; and The Struggle against Enemies of Tobacco, by O. Perrin and A. Osman.

Revista de Agricultura y Ganaderia is being published as the official organ of the Bolivian Department of Agriculture and Animal Husbandry. The initial numbers consist mainly of brief popular articles on a wide variety of topics, contributed in part by members of the department's staff.

Deutsche Landwirtschaftliche Rundschau is a monthly abstract journal of the field of technical agriculture. The initial number contains about 280 abstracts, nearly all from German publications.

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One by one the few surviving organizers of agricultural education and research in the land-grant colleges are passing away. On March 17, 1928, there occurred the death of one of the best-known and most highly revered of all the pioneers, Isaac Phillips Roberts. A farm boy without a day of college training, he became the first professor of agriculture in the Iowa State College in 1869, and five years later began at Cornell University the leadership which continued there through what have been felicitously termed the "eventful and triumphant years" from 1874 to 1903. In 1878, he was appointed the first dean of the College of Agriculture and a year later the head of the Cornell Experiment Station. Retiring from these duties at the age of 70 years with the title of professor emeritus of agriculture, he spent the succeeding period of nearly a quarter century in travel and in residence in California, dying in a San Francisco hospital from an operation designed to improve his eyesight at the advanced age of 94 years.

This bare outline epitomizes the main events in Professor Roberts' long life, but gives little indication of their significance and broad appeal. A truer conception of his services is afforded by his own words of introduction to one of his final addresses, a paper entitled *The Trend of Modern Agricultural Practice*, given before the Berkeley meeting of the Society for the Promotion of Agricultural Science in 1915, in which he said: "To those who are strangers to me it is proper to say that for more than half a century in the Middle West and in New York State, I stood on the advance line for a saner, more scientific, and more profitable use of our stupendous landed inheritance." A similar idea has been expressed by his long-time associate, Dean Bailey, in the following language: "Professor Roberts and his associates stood for agriculture, always for agriculture—not for natural science under the name of agriculture nor for some pleasant combination of studies that would satisfy the law. In an eastern university, with the great tide of emigration sweeping past him to the West, with decreasing values, with old fields, with hindering traditions, he stood—stood like a prophet."

As the years go by it becomes increasingly hard to visualize the difficulties under which the pioneers in agricultural education and research have labored. Even when the passage of the Morrill Act of 1862 had given a national sanction to the new subject of agriculture, it had to be brought into teaching form, buildings and equipment provided, farms developed, an adequate personnel recruited, and the interest secured alike of educators in other fields, the farmers themselves, and the general public.

For this strenuous and often disheartening struggle, Professor Roberts was unusually well qualified. He was born on a farm at East Varick, New York, July 24, 1833, and grew up on the shores of Lake Cayuga not far from Ithaca in a region and at a time when enough of a self-sufficient agriculture and a self-reliant country life still remained to teach resourcefulness and encourage the attempting of new tasks even though these seemed more or less outside of previous experience. His formal schooling ended with the academy at Seneca Falls, one of the very creditable secondary schools of the day. His early manhood was spent in teaching and carpentering in New York and Indiana, and in 1862 he began farming in Iowa. Seven years later, after many trials and vicissitudes but with ever-increasing growth, he was appointed superintendent of the college farm and secretary of the board of trustees of the Iowa State College, and such was his success that in a few months he was named as professor of agriculture and entered upon his long career of college teaching.

It was here, as he explains in his Autobiography of a Farm Boy, that because of the shortage of teaching material he was soon "driven to take the class to the field and farm, there to study plants, animals, and tillage at first hand." "I suppose," he has also said, "I was the first teacher of agriculture to make use in a large way of the fields and the stables of the countryside as laboratories." He retained this characteristic method throughout his teaching. Dean Bailey has said, "I have never known anyone to make such good educational use of an entire farm and its equipment." This was probably due in part to the fact that he was a master in "observing farm conditions—why the grass was thin here and heavy there, why the weeds came in, why the animals chose the spot on which to lie, how to run the drains, to build a fence, to put up a shed or barn, to paint a building, how to break a horse, how to breed a herd from a common foundation, how to sell a crop, what the weather meant, how to bring an old field back into good condition."

In 1874 Professor Roberts became superintendent of the college farm and assistant professor of agriculture in Cornell University. Previously, as he tells us, he had enjoyed the farm end of his work greatly, but had not become much interested in purely educational lines. He started in at Cornell, indeed, with little thought of more

than a short stay, but though beset from the start with such obstacles as a "pocket edition of a class," a small and badly run-down farm, and live stock consisting mostly of "10 milch cows that had among them only 22 milkable teats," and little understanding or appreciation of agricultural education within or without the university, he found that by the end of the first year, when he became professor of agriculture, "maturity and a broader outlook had caused me to understand the possibilities of agricultural education, and I determined to lay the foundations of a college of agriculture such as had never been conceived."

Slowly but steadily and with much painstaking this high ideal came to be realized. Characteristically, the farm and its equipment were his earliest concern, and by good farming and business-like methods great improvement was soon effected. He introduced into the university its first departmental inventory and devised a system of cost accounting which indicated the loss and gain of each subdivision of the farm activities. The farm buildings were repaired and enlarged, often with funds advanced from his personal means, fields were enriched, and a plant ultimately built up which fulfilled his twofold aims of a model farm and a practical laboratory for investigation and instruction.

Development in this direction led naturally into the cultivation of closer relations with farmers. Such contacts were well-nigh inevitable with a man of Professor Roberts' sympathies, traditions, and experience, starting with his nearby farm neighbors and extending in an ever widening circle. Yet even for him the task of winning confidence and influencing practice was by no means easy. As he put it, "it was as hard for the professor of agriculture to get a respectful hearing among the farmers as to get a foothold in the universities, and it required infinite patience, perseverance, and good temper." However, he went forth manfully to the State Agricultural Society, the State Dairymen's Association, and the State Horticultural Society and won an ever-growing influence, ultimately serving as president of the two first-named organizations. This was an unusual mark of confidence for the times.

Even before returning to New York Professor Roberts was a frequent participant in the early farmers' institutes organized and conducted by President A. S. Welch and his associates at the Iowa College. This experience he repeated in 1886 when the first farmers' institute to be held in New York assembled in Ithaca in response to a call which he had issued jointly with Mr. J. S. Woodward of Lockport. This venture was so well received as to lead to the regular holding of institutes under the auspices of the State Agricultural Society, beginning with the following year.

In all this work, Professor Roberts was emphatically the man for the occasion. As Dean Bailey has said, "it was not then a day for erudition, or for high scholarship, but a time for clear faith, homely and direct relations with people, wisdom in giving advice." These attributes he possessed in abundant measure, and in such ways and with the aid of well-chosen and competent associates he gathered together a following and developed an interest in his institution which in the end led to generous State support and the reorganization of the work into the New York State College of Agriculture.

But Professor Roberts' interests were not restricted to farmers and their organizations. In 1881 he became a member of the new Society for the Promotion of Agricultural Science, and in 1885 he was a delegate and active participant in the first conference of agricultural college and experiment station workers called by Commissioner of Agriculture Norman J. Colman. For many years he was a familiar figure in the Association of American Agricultural Colleges and Experiment Stations, "always practical, always driving home the point, always with his feet squarely on the ground."

One of his typical addresses was given at the second convention of the association in 1889 on the topic How Can Stations Reach and Interest Farmers. In this he spoke of the "yearning desire of many for more information." "So well am I convinced," he said, "that the minds of the masses have become receptive, that I predict that the question in the near future will be not how we may reach the farmer, but how we may satisfy his demands; provided the teacher is wise in the method of presenting the subject to be taught."

Yet he urged caution in the general distribution of publications until farmers were ready for them. "The bulletins should not be cheapened nor sent for any great length of time to those who are not interested in them. If they are spread broadcast after the manner of patent-medicine dodgers, they will be considered to be scarcely more valuable." "A desire must be created in the many by the few who gladly receive the truth, and the lessons taught must be so plain, so simple, so convincing, that they will create desire, carry conviction, and incite to action." As a preparatory and cooperating medium he recommended the use of the "journals of the city and country," since "a fact or a suggestion in agriculture, published in a paper which has been read and trusted for years, meets with a receptive mind and finds congenial soil in which it is likely to take root and ultimately bear fruit."

Presumably in furtherance of this same idea, he was himself a frequent contributor to the farm press for many years, and thereby came to wield additional influence among farm people. He was also the author of several widely-read books, among them *The Fertility of the Land* (1898), *The Farmstead* (1900), *The Farmers' Business*

Handbook (1903), **The Horse** (1905), and his **Autobiography of a Farm Boy** (1916), in which the story of his life is depicted in his own inimitable way.

Professor Roberts' connection with the Cornell Experiment Station was as intimate as in other phases of the university's work. The station itself was organized as a department of the university in 1879, with Professor Roberts as president of the board of control and a member of the executive committee to which its affairs were entrusted. Although the only funds for some years consisted of small grants from the university and a private contribution for the printing of its reports, and work was restricted to time not required for other duties in the university, many valuable experiments were carried on.

When the Hatch Act was passed considerable work was under way, and reorganization was promptly effected with Professor Roberts as director and with divisions of agriculture, chemistry, veterinary science, botany, horticulture, and entomology. In the 15 years of his directorship which followed, State aid was secured in steadily increasing measure. Special attention was given to problems in horticulture and dairying, and not a little was accomplished with plant diseases, entomology, feeding experiments, sugar beet and potato culture, care of barnyard manure, tillage, and veterinary science. While Professor Roberts' personal contributions along experimental lines may not have been so extensive or fundamental as some of his contemporaries, they were ever pertinent, timely, and practical. Then too, in addition to what he did himself, he had the genius to select, inspire, and retain others to do some of the things which most needed doing, at the right time and in the right way. Hence, "he gathered about him many specialists, gave them every facility and equipment he could secure, and left them with great freedom."

Probably, however, it was as a teacher and as a guide of men that he was at his best. In the words of a recent tribute in *American Agriculturist* from Mr. Jared Van Wagenen, jr., who was one in what Professor Roberts called "that inspiring and almost endless procession of college students, who, class by class, looked up at me from their seats with eager minds for 30 years," "I suppose it is true that according to our usual canons he might in no sense be accounted a great scientist. Indeed he never learned to handle easily and surely upon the lecture platform the vocabulary of technical agriculture. He was very largely a self taught man with the limitations of those so trained, but he was master of a gentle and inspiring philosophy of life that was infinitely better than any pronouncement in the strange, cold terms of science. He was also a singularly wise farmer with a great accumulation of wisdom which he had garnered in the labora-

tory of fields and woodlands and under the open sky." To his boys, he discoursed "concerning very many things—concerning the growing of wheat and corn and clover and the feeding of sheep and the fattening of pigs and of how best to plow and how to plan barns and of all farm affairs. He spoke too sometimes of other things—of things which young men ought to know—of love and of marriage and of children—of religion and politics and community service—thus mingling the science of agriculture with the greater science of human relations. There were none of us, I imagine, but went out of that lecture room with rosy dreams and high resolves for better living and greater things."

So too, with that larger host whom he met at institutes and other farm gatherings and elsewhere, he did not teach, to quote Dean Bailey once more, "some small department of farm knowledge as we do in these days, but the whole farm and the farmer and the wife and the children and the hired man; and he taught it with a quiet and genial philosophy, often quaint and always full of good humor."

He was, indeed, a prophet of agriculture, filled with understanding and vision, but it is a satisfaction to recall that the traditional fate of the prophet did not long befall him. When he was given the honorary degree of master of agriculture from the Iowa College in 1875, he was the first to receive such a degree from any institution in this country, but this was only the forerunner of many other honors and tributes which came to him in abundance during his long life. Such recognition was well deserved. For many reasons he was easily a leader among the group of so-called "practical men" who rendered such yeoman service in the pioneer days, but because, unlike many practical men, he did not insist that all science should have immediate application but could look ahead and build wisely and surely for the future, he helped to lay the foundations of agricultural education and research in this country in a way and to a degree which will not soon be forgotten.

Willet Martin Hays, Assistant Secretary of Agriculture from 1905 to 1913 and for many years actively engaged in the promotion of agricultural education and research along original lines, died at Eldora, Iowa, on January 15, 1928. Of a later generation than Professor Roberts and working under materially different conditions, he was likewise a pioneer. What is the more remarkable, he was a pioneer of unusual versatility and resourcefulness in that he labored in no fewer than three large and diverse fields of agricultural thought. Successful as a teacher and investigator in what was in his day still known collectively as agriculture, he will perhaps be most widely remembered as an earnest and vigorous leader in plant breeding and other genetics investigations, cost studies and similar

inquiries in farm management and related phases of agricultural economics, and the development of a complete and comprehensive system of education for farm boys and girls. In each of these three fields his service was timely and important.

Professor Hays was born on an Iowa farm in 1859, and he was educated in the same State, attending in turn Oskaloosa College, Drake University, and the Iowa State College. From the last-named institution he received the degree of bachelor of agriculture in 1885 and that of master of agriculture in 1896. He spent short periods as assistant in agriculture in the Iowa College in 1886, associate editor of *The Prairie Farmer* in 1887, and professor of agriculture and agriculturist in the North Dakota College and Station in 1892-93, but it was with the University of Minnesota from 1888 to 1892 and again from 1894 to 1904 that he was longest and most intimately identified.

In the early nineties most of the experimentation carried on in this relatively new region very naturally consisted of variety testing, comparisons of cultural methods, and similar relatively simple work. Professor Hays was among those who realized the importance of more fundamental investigations, and in 1894 he wrote that "not content with the best kinds of corn, wheat, oats, barley, field peas, timothy, etc., which the world affords, we have well under way numerous new varieties produced by selection and by a combination of crossing and selection." Large scale breeding operations by the centgener method which he introduced in 1891 were carried on under his direction with wheat and other cereals and various grasses, and many valuable strains of crops especially adapted to the climatic conditions were developed, but another result of significance was the arousing of his interest in the broad general question of the breeding of improved plants and animals. With this end in view he helped to organize the Minnesota Field Crops Breeders' Association and later the American Breeders' Association, subsequently rechristened the American Genetic Association. He served as secretary of the latter association from 1903 to 1912, editing its reports and the *American Breeders' Magazine*, now *The Journal of Heredity*. From 1902 to 1904 he also contributed a series of articles to *The Breeder's Gazette*, which were issued in 1904 in book form under the title of *Breeding Plants and Animals* and constituted one of the first texts available on the subject.

As early as 1894 he was giving instruction in farm management. Indeed in the previous year he had proposed "a practical study of field management by setting apart the various fields of the farm each year as distinct enterprises," and had devised "a simple practical scheme of accounts by which the cost of each field can be recorded."

In 1902 he began, in cooperation with the Division of Statistics of the Federal Department of Agriculture, studies of the cost of growing field crops in three Minnesota counties, which were afterwards broadened to include the entire farm enterprise and published jointly by the Department and the Minnesota Station. As Assistant Secretary of Agriculture his interest in agricultural economics was shown in many ways, including his aid in instituting the cost of production studies of the Department, his preparation of a book on Farm Development which appeared in 1910, and the issuing in 1912 as a joint publication of the Bureau of Plant Industry and the Minnesota Station of the comprehensive bulletin entitled Farm Management: Organization of Research and Teaching, "at least as a guide if not as a text in teaching farm management."

The third field to which Professor Hays actively contributed was that of agricultural education. Here his immediate objective was to provide for farm boys and girls more adequate educational opportunities and better articulated courses as a means of stimulating the vocational, home, and community life of the open country. He advocated the consolidation of rural elementary schools, the establishment of a considerable number of secondary schools of agriculture and home economics, and the adoption of a curriculum reaching from the elementary schools through the high school to the college, in which nature study, agriculture, and home economics should be prominent but at the same time carefully correlated with the usual cultural subjects. He was a strong believer in the State university as the capstone of the State's educational system, and he rendered a great service in Minnesota by contending sturdily and persistently for the upbuilding of its College of Agriculture and the maintenance of high educational standards.

Another need which he clearly visualized was for the popularization and reduction to a sound pedagogic basis of the large amount of technical information which was accumulating in relatively unavailable form for school use. In 1903 he published a text entitled Rural School Agriculture, and subsequently he prepared numerous publications issued by the Office of Experiment Stations and other agencies in which his views on education were presented in considerable detail.

He was an early and zealous advocate of secondary education and agricultural extension in the Association of American Agricultural Colleges and Experiment Stations, the American Association of Farmers' Institute Workers, the National Education Association, and elsewhere. He had much to do with the establishment of the system of secondary agricultural schools in Minnesota, and he was intimately associated with the measure introduced into Congress in 1907 by Hon. Charles R. Davis of that State proposing the granting of

large Federal appropriations for secondary school instruction in agriculture, home economics, and mechanic arts, and subsequently modified to include branch experiment stations, normal school instruction in agriculture, and other matters. While the Davis bill never became law in its entirety, it proved to be the forerunner of such important legislation as the Smith-Hughes Vocational Education Act of 1917 and the Smith-Lever Agricultural Extension Act of 1914.

In sponsoring these measures, Secretary Hays soon came to see and to stress the importance of immediately providing funds for training teachers if the new institutions were to function efficiently. With this aim in view he took a prominent part in the formulation and advocacy of the Nelson amendment of 1907, the passage of which ultimately doubled the Morrill appropriations of 1890, and which carried a proviso that the colleges "may use a portion of this money for providing courses for the special preparation of instructors for teaching the elements of agriculture and the mechanic arts."

Upon leaving the Department of Agriculture, he spent about two years in Argentina as advisor to the Minister of Agriculture and the University of Tucumán. Ill health came upon him in 1915 and led to his virtual retirement at the age of 56 years. Yet even with this abbreviated period of activity, he accomplished much and set in motion even more. To-day the three great projects which he sponsored so enthusiastically and persistently are so firmly established that it is difficult to realize how a generation ago they were looked upon as more or less dubious innovations. That they have become so thoroughly acceptable and accepted in so short a time is due in no small measure to such ardent champions as Professor Hays.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Dissociation pressures of ammonium orthophosphates, T. E. WARREN (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 8, pp. 1904-1908, fig. 1).—Noting the increasing importance as fertilizers of the ammonium phosphates, at present most economically prepared from gaseous ammonia and concentrated phosphoric acid solutions, the author of this contribution from McGill University presents measurements of the dissociation pressures of the mono-, di-, and tri-ammonium phosphates. The determinations were made by an air-saturation method in the cases of the mono- and diphosphates with the use of a measured quantity of purified air are passed through layers of the powdered salts alternated with glass wool in a constant temperature device, the ammonia content of the air at equilibrium with the salt having been determined by absorption in excess of standard acid. In the case of the tri-ammonium salt, the dissociation pressure of which was too great to permit of measurement in the air-saturation apparatus, the determination was made by a static method. The latter determinations are considered not to have been as accurate as those made by the air-saturation procedure.

On the basis of the data thus secured, it was found possible to prepare any one of the three phosphates with the exclusion of both of the others by treating the phosphoric acid solution with ammonia-air mixtures of appropriately adjusted partial pressures, no further ammonia being absorbed after the formation of the desired salts, when the partial pressure of the ammonia had been adjusted to the dissociation pressure, as determined, of the salt to be prepared. The dissociation pressure figures found were, for the mono-ammonium phosphate, less than 0.05 mm. over the temperature range of from 80 to 125° C., for the di-ammonium salt, 1.4 mm. at 80°, and 30 mm. at 125°, and for the tri-ammonium salt, less accurately determined, 730 mm. at 110° and 1,170 mm. at 125°.

A synthesis of taurine, C. S. MARVEL, C. F. BAILEY, and M. S. SPARBERG (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 7, pp. 1833-1837).—Taurine is noted as being not only of considerable interest to the physiological chemist but also as very difficult to prepare in any quantity from the natural resources ordinarily employed. The following synthesis is founded upon the observation of Kohler¹ that 2-bromo-ethylsulfonic acid is obtainable from ethylene bromide and sodium sulfite, a search of the literature revealing no details, however, with regard to the carrying out of this reaction. The preparation was accordingly studied by the authors and found to run very smoothly, with yields of about 80 per cent.

Sodium 2-bromo-ethylsulfonate.—Place 615 gm. of ethylene dibromide, 1,250 cc. of 95 per cent alcohol, and 450 cc. of water in a 5-liter flask fitted with a reflux condenser, mechanical stirrer, and separatory funnel. Heat the mixture to boiling with the stirrer in operation. Add to the well-stirred boiling mixture a solution of 125 gm. of sodium sulfite (anhydrous salt) in about 450 cc. of water, making the addition gradually through the separatory funnel over a period of about 2 hours. Boil the solution under reflux for 2 hours after all of the sulfite solution has been added, then set the condenser for distillation

¹ *Amer. Chem. Jour.*, 20 (1898), No. 8, pp. 680-695.

and distill off the alcohol and ethylene bromide. Pour the remaining water solution into a large evaporating dish and evaporate to dryness on the water bath. Extract the sodium 2-bromo-ethylsulfonate from the sodium bromide and unchanged sodium sulfite with 2 liters of boiling 95 per cent alcohol. Use the mother liquor remaining after cooling the solution to bring about the crystallization of the greater part of the salt for a second extraction of the residue.

Taurine from sodium 2-bromo-ethylsulfonate.—Dissolve 110 gm. of sodium 2-bromo-ethylsulfonate (the product used by the authors contained from 5 to 6 per cent of sodium bromide) in about 2 liters of concentrated aqueous ammonia (density, 0.9). Allow to stand for from 5 to 7 days and then evaporate to dryness. Remove the last of the water by heating on a steam bath. Dissolve the residue in the minimum amount of hot water and treat, if necessary, with decolorizing carbon. Concentrate the colorless solution to from 65 to 70 cc., then add about four volumes of 95 per cent alcohol. When crystallization is complete, collect the crude taurine on a filter and then recrystallize by dissolving in hot water and add to the solution enough 95 per cent alcohol to give a final concentration of 80 per cent of alcohol. This second crystallization usually gave taurine free from bromides. Some runs had been recrystallized four or five times, however, to remove all of the sodium bromide. The yield of pure taurine was from 31 to 36 gm., or from 44 to 51 per cent.

It is noted that the concentration of alcohol in the preparation of the sodium 2-bromo-ethylsulfonate appears important, poorer yields having been obtained when it was changed in either direction. It is further noted that the large excess of ethylene bromide is necessary to avoid the formation of the disulfonic acid. By dilution of the alcoholic solution distilled after completion of the reaction, it is stated to be possible to recover nearly 400 gm. of the excess ethylene bromide.

Some relations of the phospholipins in seeds to other constituents, N. B. GUERRANT (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 11, pp. 1001-1019).—Analyses at the Oklahoma Experiment Station by the customary methods for ash, fat, protein, total phosphorus, and lipid phosphorus of some 60 samples of seeds are presented in tabular form, together with similar data, with the addition of figures for water-soluble phosphorus, on the yellow milo and darso seeds after germination in the light and in darkness. These results are discussed, and various inferences are pointed out.

The phospholipin content of seeds was found to be as variable as many of the other constituents, and was independent of the color and size of the seeds. In general, the highest percentages were found in seeds having the highest protein and fat contents, although this was not always true. The total phosphorus increased with an increase of phospholipins, but the relationship was not definite.

During germination both samples lost about 10 per cent of their dry matter in 10 days, the loss being slightly less when germination took place in the dark. The percentage and amount of both protein and fat decreased in the dry matter in all cases, while both the percentage and amount of water-soluble phosphorus and lipid phosphorus increased. The lipid phosphorus showed a greater increase when germination took place in the light. There appeared to be no relationship between the increase in lipid phosphorus and the changes in ash, protein, fat, or total phosphorus.

The non-volatile acids of the pear, quince, apple, loganberry, blueberry, cranberry, lemon, and pomegranate, E. K. NELSON (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 5, pp. 1300-1302).—Examining the proportions of the organic acid constituents of a number of fruits by means of ester distillation, the author found the Bartlett pear acids to consist of a mixture of about 2 quarts

of citric acid and 1 part of malic acid. Winesap apples were found to contain *l*-malic acid with a trace of citric acid, but York Imperial apples yielded no citric acid. These results are noted as being contrary to those obtained by Franzen and Helwert,³ who found a very considerable amount of citric acid in apples.

About 96 per cent of citric acid and about 4 per cent of *l*-malic acid were found in loganberries, isocitric acid not having been detected. In blueberries the predominating acid was found to be citric, a small quantity of *l*-malic acid having also been found. The cranberry acids were found to consist of a mixture of about 80 per cent of citric acid with about 20 per cent of *l*-malic acid, together with 0.069 per cent of benzoic acid. California lemons yielded citric acid, with a very small proportion of *l*-malic acid. Citric acid only was found in the pomegranate.

The pectic constituents of tomatoes and their relation to the canned product, C. O. APPLEMAN and C. M. CONRAD (*Maryland Sta. Bul.* 291 (1927), pp. 17, figs. 2).—This is a report of experiments on the more or less extensive disintegration of canned tomatoes, this effect being attributed to the conversion of the intercellular protopectin into pectin during the ripening and canning of the fruit.

Determinations of moisture, of the H-ion concentration, of pectin, and of protopectin were made. The usual procedures were used for this analysis with the exception that in the determination of the pectin and protopectin the calcium pectate precipitates were found not to be sufficiently purified and were, therefore, dried to constant weight and then boiled 45 minutes with 1 per cent ammonium citrate solution. This was shown to dissolve only the calcium pectate, so that the weight of the insoluble residue gave, when deducted from that of the original crude calcium pectate, the actual weight of the calcium pectate corresponding to the pectin or protopectin to be determined. For the estimation of the degree of disintegration, a procedure similar to that of Bigelow (*E. S. R.*, 38, p. 63), and consisting essentially in the spreading of the contents of the cans in wire baskets and draining for 5 minutes, was used.

The protopectin, predominant in the green fruit, was found to change rapidly into pectin during the later stages of ripening. The pectin-protopectin ratio increased, for example, from 1.13 to 2.56 from the pink to the red ripe condition of the fruit, this change being attributed to enzyme action. In the canning processes the change is continued by the action of heat in the presence of acids, the latter form of the change continuing actively during slow cooling or "stack" cooking. Increases in active acidity were not found to occur during processing, but a consistent though slight increase in the acidity with the advancing picking season was observed in the fresh tomatoes of all the varieties examined. A marked correlation between the pectin-protopectin ratio and the degree of disintegration in the canned product was noted. In general the midseason pickings yielded the best packs and showed correspondingly the least transformation of protopectin into pectin. The stage of ripening was shown to be of much greater importance than any varietal differences among the four varieties used in these experiments.

Relation of temperature to rate and type of fermentation and to quality of commercial sauerkraut, H. B. PARMELE, E. B. FRED, W. H. PETERSON, J. E. MCCONKLE, and W. E. VAUGHN (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 11, pp. 1021-1038, figs. 17).—The experiments here reported from the Wisconsin Experiment Station included the preparation at temperatures of approximately

³ Hoppe-Seyler's Ztschr. Physiol. Chem., 127 (1923), No. 1-3, pp. 14-38.

45, 55, 65, and 75° F. in eight vats of 8-ton capacity each, of batches of sauerkraut from several lots of cabbage. The moisture content and percentage of total, of water-soluble, and of amino nitrogen, of reducing sugars, and of sucrose were determined. Analyses and quality ratings of the various batches are reported, together with bacteriological and other observations on the progress of the fermentation.

It is concluded in part that the lactic acid fermentation of cabbage is accompanied by heat and is largely dependent upon the temperature, the higher temperature favoring a greater rate of acid production. Titratable acidity is considered a better measure of the degree of fermentation than pH determinations. The fermentation of cabbage was found to be carried on by a sequence of bacterial flora, at least two distinct types of lactic acid-producing bacteria having been observed. The time of reduction of methylene blue is considered of value as an indication of bacterial numbers in the fermenting cabbage. The best quality of sauerkraut was produced at a maximum fermentation temperature of about 65°.

The relation of atmospheric humidity to the deterioration of evaporated apples in storage, C. W. CULPEPPER and J. S. CALDWELL (*Jour. Agr. Research* [U. S.], 35 (1927), No. 10, pp. 889-906).—This is a contribution from the U. S. D. A. Bureau of Plant Industry, reporting the results of three years' storage of evaporated apples under various conditions of initial moisture content and of atmospheric humidity during the storage period. Temperature variations are considered also to play a very important part in the determination of the rate and extent of deterioration, but in the storage experiments here reported the material was held at from 20 to 30° C. (68 to 86° F.). Laboratory experiments on the relative hygroscopicity of dried apple material are also noted.

At 18.8 per cent or less of relative humidity the material retained its original color, odor, and flavor throughout the entire storage, and at a relative humidity of from 47 to 80.5 per cent no mold or yeast growth took place, but discoloration, rancid odor, and bitter flavor developed, the material becoming unmarketable before the end of the storage period. This type of deterioration appeared within one year in evaporated apples initially dried to a moisture content of from 9 to 10 per cent, and was not prevented by the treatment of the fruit with sulfur dioxide, with 2 per cent sodium chloride solution, or by heating to 80° prior to drying. At relative humidities above 80.5 per cent sufficient moisture was absorbed to permit rapid mold and yeast development, with the destruction of the material in a few months.

The laboratory experiments indicated a high degree of hygroscopicity in the dried fruit, material having a moisture content of from 13 to 15 per cent having been found in approximate equilibrium with the atmosphere over a sulfuric acid solution having an osmotic pressure of 750 atmospheres. Fruit having the standard moisture content of 24 per cent was found to be approximately in equilibrium with air at 75 per cent relative humidity at 30°.

It is concluded that, for the prolonged storage of evaporated apples, drying to the point not merely of prevention of growth of organisms but to a moisture content low enough to insure against oxidations and other changes not due to the development of organisms, a humidity in the storage chamber equal to or less than that in equilibrium of the stored material, and packing with the use of the most efficient means available for the exclusion of atmospheric oxygen from the material are all necessary to satisfactory preservation.

A hitherto unsuspected source of arsenic in human environment, R. E. REMINGTON (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 6, pp. 1410-1416, figs. 2).—Determinations of the arsenic content of a number of samples of American pipe,

smoking, and chewing tobaccos, with results indicating from 6 to 80 parts per million, are reported in this contribution from the North Dakota Agricultural College. A form of the Marsh method was used, the arsenic mirrors having been dissolved in 0.002 N iodine, the excess of which was titrated with thiosulfate of the same normality. When the smoking tobaccos were smoked in an apparatus permitting the collection of the evolved arsenic in 1 per cent sodium carbonate, it was shown that about one-half of the arsenic content of the pipe tobacco examined was evolved in the smoke, and about one-half of the arsenic found in the chewing tobaccos was found to be soluble in water. The author calls attention to the fact that the quantities of arsenic reported are greatly in excess of those permitted by State or Federal authorities in foods and of the quantities normally present in either plants or animals.

The determination of arsenic pentoxide as magnesium ammonium arsenate, W. M. McNABB (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 6, pp. 1451-1453).—This is a study of the conditions of the precipitation and conversion to pyroarsenate of magnesium ammonium arsenate, contributed from the University of Pennsylvania.

It was found (1) that allowing the arsenate solution to stand for from 12 to 24 hours with the magnesia mixture is unnecessary, the precipitation having been shown to be complete in 0.5 hour, and (2) that ignition for 10 minutes at a temperature of 800 to 900° C. is excessive, resulting in a continuous loss, accurate results having been secured by ignition to constant weight at from 500 to 600°. Heating in a double crucible to the point of obtaining a light red glow only in the outer crucible gave high results.

Thioglycolic acid as a color test for iron, E. LYONS (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 8, pp. 1916-1920).—Thioglycolic acid is recommended as a delicate color test for iron, the reagent being capable of detecting ionic iron in dilutions as great as 1 part in 10,000,000, a sensitiveness which is said to be very much greater than the usual thiocyanate test. The test is made as follows:

Add one drop of the reagent to about 5 cc. of the neutral or slightly acid solution, and then add further about 0.5 cc. of concentrated aqueous ammonium hydroxide. The color produced is described as a reddish purple to red. If no color appears within five minutes, it is considered that less than 1 part of ionic iron in from 10,000,000 to 12,000,000 is present. The reaction was found to be actually one for ferrous iron, but either ferrous or ferric iron produces the color on account of the prompt reduction of ferric iron to the ferrous state by the reagent itself. It is noted that since the thioglycolic test is applied in ammoniacal solution, a condition which causes the complete discharge of the ferric iron and thiocyanate color, the two tests may be applied successively to the same solution. A quantitative colorimetric method based on this reaction is also described.

The use of methoxytriphenyl carbinols as one-color indicators, I. M. KOLTNOFF (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 5, pp. 1218-1221).—Noting the fact that only one-color indicators hitherto available have been colorless in acid and colored in alkaline solutions, the author proposes the use of triphenyl carbinol derivatives containing 5, 6, or 7 methoxy groups, these being colorless in alkaline and colored in acid solutions. The pH ranges covered by these indicators are 2, 4, 6, 2', 4', 2'', 4'' heptamethoxytriphenyl carbinol, proposed abbreviated name heptamethoxy red, pH 7.0 colorless to pH 5.0 red; 2, 4, 2', 4', 2'', 4'', hexamethoxytriphenyl carbinol, proposed abbreviated name hexamethoxy red, pH 4.6 colorless to pH 2.6 pink red; and 2, 4, 2', 4', 2'' pentamethoxytriphenyl carbinol, proposed abbreviated name pentamethoxy red, pH 3.2 colorless to pH 1.2 red violet. Other physical and chemical properties of these indicators are given, together with examples of their use in titration. It is noted that hepta-

methoxy red changes color too slowly to be of use in titrations, but that the other two indicators are satisfactory in this respect.

The detection of extracted olive oils, M. F. LAURO (*Oil and Fat Indus.*, 4 (1927), No. 9, pp. 324, 325).—The author finds the coin test insufficiently sensitive for the detection of minute traces of sulfur compounds, the presence of which follows the use of carbon bisulfide as extractant. In the case of solvent process preparations of olive oil, such organic salts of silver as the oleate, salicylate, or better the benzoate can be employed, according to this note, at temperatures lower than are necessary with the metallic silver and show a greater sensitiveness. By comparing the test on an adulterated oil with a blank test on a known pure oil, it was found possible to detect the addition of as little as 0.2 per cent of olive oil foots in a pressed oil. The test is made as follows:

Heat about 5 cc. of the oil in a test tube to 150° C., and add a small quantity of powdered silver benzoate from a spatula and shake into the oil. In the presence of sulfur-bearing solvents darkening begins immediately, the discoloration being proportionate to the percentage of sulfur present. If a mere trace of sulfur compound is present, the benzoate may be added to the oil before heating. Care must be taken to avoid scorching the oil. It is considered that with 0.02 gm. of silver benzoate added to 5 cc. of oil the test may be made quantitative by comparing the color produced with that of standards containing known amounts of olive oil foots or of carbon bisulfide if these standards be made up and run at the same time. It is noted that rancid, inferior, and highly acid olive oils may contain many compounds that affect silver salts, so that some reduction may occur. This was found to be slight, however, under the conditions of the test, and easily differentiated from the sulfide color produced by oils containing carbon bisulfide.

The behavior of fish oils with uranium nitrate and pyrogalllic acid, W. H. DICKHART (*Oil and Fat Indus.*, 4 (1927), No. 9, pp. 326–328).—The following test is recommended for the detection of contaminants in cod-liver oil:

Place in a test tube 10 mg. of powdered uranium nitrate and 3 cc. of the fish oil, to be tested, then place the tube in the steam bath for 20 minutes, shaking occasionally, remove, and observe the color, which should be as follows: Cod-liver oil (U. S. P.), amber, showing a greenish cast with transmitted light; Norwegian sperm oil, light amber, no difference with transmitted light; menhaden oil, crimson red; pilchard oil, light red; whale oil, light brownish red; herring oil, blood red; sardine oil, blood red; and Newfoundland cod oil, blood red.

The behavior of soaps of various oils on dilution, H. B. STOCKS (*Oil and Fat Indus.*, 4 (1927), No. 9, pp. 315–319).—The alkali metal soaps obtainable from various oils show markedly different degrees of hydrolysis at any given dilution in aqueous solution. The lower members of the fatty acid series form salts which are hydrolyzed to a much less extent than are those of the higher acids, the latter, according to the present author's observations, giving soaps which show about 50 per cent hydrolysis in aqueous solutions of suitable dilution. The following test for the detection of adulterants in castor oil is based upon this effect and upon the preponderance of ricinoleic acid among the fatty acid constituents of castor oil:

Saponify 5 gm. of the oil by heating with a slight excess of alcoholic potash solution under a reflux condenser with added phenolphthalein and neutralize the liquid exactly with hydrochloric acid. After evaporating off the alcohol, add water to the residue and cool. After solution is complete make up to 100 cc. Further dilute 10 cc. of this solution to 250 cc. with boiled distilled water and titrate with decinormal hydrochloric acid, first in the presence of phenol-

phthalein and, after reaching the end point of this indicator, with the addition of methyl orange. In the author's experiments, only from 0.5 to 0.8 cc. of the decinormal acid was required in the first titration, most other fats and oils requiring 8 or 9 cc.

A table is given in which are shown the results of determinations of peanut oil in known mixtures of castor oil and peanut oil from 100 per cent castor oil to 100 per cent peanut oil in 10 per cent steps. The corresponding figures obtained were peanut oil added 10 per cent, found 9.9 per cent; added 20, found 19.8; added 30, found 29.7; added 40, found 41.7; added 50, found 49.5; added 60, found 61.5; added 70, found 70.9; added 80, found 80.2; and added 90, found 90.1.

Determination of neutral fat in soaps.—L. F. HOYT (*Oil and Fat Indus.*, 4 (1927), No. 10, pp. 357-359).—The following procedure, described as an adaptation of the usual method for the determination of saponification numbers, is proposed as a rapid and accurate control method for neutral fat in soaps:

"Weigh a sample of soap of from 10 to 15 gm. (depending on moisture content) to 0.1 gm. Dissolve in 150-200 cc. of hot neutral alcohol (94 per cent or higher). If the alcoholic solution is not entirely clear and free from alcohol-insoluble matter, filter with suction through a Gooch crucible, protecting the solution from carbon dioxide or other acid fumes, and wash the crucible with hot neutral alcohol until free from soap. Unless the resulting alcoholic soap solution is neutral to phenolphthalein indicator, add just enough aqueous alkali or acid as required to neutralize any free acidity or free alkali in the soap. To the neutral alcoholic soap solution, add 10 cc. alcoholic KOH (40 gm. per liter in aldehyde-free 94 per cent alcohol) accurately measured with a pipette or burette. Attach to a reflux condenser and boil for 30 minutes. Run a blank in the same manner with 150 cc. neutral alcohol and 10 cc. alcoholic KOH accurately measured, boiling under reflux as with the sample. While still hot titrate both blank and sample with $N/2$ aqueous acid. From the number of cubic centimeters of alcoholic potash absorbed, calculate the percentage of neutral fat in the sample."

The relation between the deflocculating and frothing powers of soaps. R. M. CHAPIN (*Oil and Fat Indus.*, 4 (1927), No. 6, pp. 210-214, figs. 7).—This contribution from the U. S. D. A. Bureau of Animal Industry describes experiments in which the essential features of the author's graphite test (*E. S. R.*, 54, p. 806) for relative detergent power in soaps and of a test dependent upon the estimation of the relative capacity of various soaps to disperse carbon black and carry it through a filter paper have been combined. A possible modification of the carbon black procedure is suggested. Frothing and deflocculation appeared in these experiments to be concomitant rather than sequent effects and to have a similar mechanism. The parallelism between the two effects was found to be so poor, however, that the author considers tests of frothing power, qualitative or quantitative, to be of little value as indices of probable deflocculating capacity.

METEOROLOGY

Climatological studies, VII-XIII [trans. title], D. SZYMKIEWICZ (*Acta Soc. Bot. Polon.*, 4 (1926), No. 1, pp. 55-63, pl. 1, fig. 1; 4 (1927), No. 2, pp. 125-140, fig. 1).—Continuing an article previously noted (*E. S. R.*, 54, p. 807), the author discusses classification of climates, correlation of the factors affecting evaporation and transpiration, importance of cloud measurements in ecological phytogeography, a new actinometer, moss as an index of humidity of the air, an unusual desert (with humid air) in southwest Africa, and diurnal maxima of the index of evaporation.

Climatic and plant relations in Germany [trans. title], E. WERTH (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 33* (1927), pp. 40, pls. 11, figs. 10).—The various climatic and vegetation districts of Germany are mapped and described, and discussed in relation to the agricultural use of the land and zones especially suited to certain crops.

Climatological data for the United States by sections, [September–October, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14* (1927), Nos. 9, pp. [195], pls. 5; 10, pp. [192], pls. 6).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1927.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. BAUMGAFTNER (*Massachusetts Sta. Met. Buls. 467–468* (1927), pp. 4 each).—The usual summaries are given of observations at Amherst, Mass., during November and December, 1927. The December number gives an annual summary, from which the following data are taken:

Mean pressure 30.025 in.; mean (hourly) temperature 47.6° F., highest 91° July 13, lowest –12° January 27; total precipitation 46.96 in., snowfall 31.5 in.; cloudiness 2,477 hours; bright sunshine 1,984 hours (45 per cent); prevailing direction of wind, west southwest; total movement 49,451 miles, maximum daily 506 miles February 4; last frost in spring May 3, first in fall October 11; last snow April 5, first November 10.

Floods of the Mississippi River from a meteorological standpoint, H. C. FRANKENFIELD (*Bul. Amer. Met. Soc., 9* (1928), No. 2, pp. 35–37).—This is the author's abstract of his full report, which has been previously noted (*E. S. R.*, 58, p. 412).

SOILS—FERTILIZERS

Electrodialysis of soil: 1, A study of the method, H. HUMFELD and A. O. ALBEN (*Jour. Amer. Soc. Agron., 19* (1927), No. 11, pp. 984–993, figs. 3).—This is an extension of the work already noted in a preliminary report from the Iowa Experiment Station (*E. S. R.*, 58, p. 514), on the application of the Mattson cell (*E. S. R.*, 56, p. 115) to the study of base exchange by means of electrodialysis. The present paper presents some further modifications in the construction and operation of the cell and the examination of the dialysate, together with data from an electrodialysis of 100 gm. of Carrington loam soil and a curve showing the extraction in milliequivalents of bases plotted against the duration of the experiment in hours, the form of the curve indicating the practical completion of the process at about 50 hours.

With respect to details of method, it was found that 15 volts direct current obtained from a rectifier gave a dialysis rate too slow for practical use, but that a pressure of from 50 to 55 volts from a motor generator was satisfactory. The cooling system described in the paper previously noted was deemed preferable to resistance in series with the cell as a means of temperature control. Hourly changing of the solution in the outer compartments of the cell was unnecessary, longer periods between changes causing no reduction in the rate of dialysis. In the determination of the total replaceable bases of the cathodic dialysate methyl red was preferable as an indicator to phenolphthalein, the end point of the latter indicator occurring at too high a pH value to permit the inclusion of the iron and aluminum among the total bases determined by the titration.

A simplified cell for determining the electrodialysable base content of soils and permutits, R. BRADFIELD (*Jour. Amer. Soc. Agron., 19* (1927), No. 11, pp. 1015–1020, fig. 1).—This contribution from the Missouri Experiment Station, noting the advantages of electrodialysis over direct exchange methods

in the study of exchangeable cations, describes and figures a simple apparatus suitable for the electro dialysis of 10 gm. samples of soils with recovery of the exchangeable cations. Essentially the device consists of a dense aluminum extraction thimble, surrounded by a perforated nickel cylinder serving as cathode, and containing a perforated platinum foil anode, this combination being mounted in a jacket of insoluble glass provided with means for the periodic washing out of the electro dialysate. A constant level water reservoir is also provided for the control of the height of the liquid in the inner vessel. This cell, which is both simple and inexpensive, is considered well adapted for routine work. Examples of the use of the two-compartment cell are described, and the data obtained are presented in comparison with those found for the same soil samples when subjected to the base exchange procedure with normal ammonium chloride.

Influence of soil reaction on plant growth [trans. title], R. HILBIG (*Bot. Arch.*, 15 (1926), No. 5-6, pp. 385-423, figs. 8).—A study of 51 soils is indicated in connection with the influence on plant growth of acidity or alkalinity.

The evolution of meadows and marshes, I. A. GETMANOV (*K Voprosu ob Evolutsi Lugo i Bolot. Leningrad: Nauch. Melior. Inst.*, 1925, pp. 114, pls. 2, figs. 9).—This is a historical, geographical, and geological monograph on the development of a marsh district in the Government of Leningrad.

Soil survey of the Gilroy area, California, S. W. COSBY and E. B. WATSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1923, pp. IV+599-642, pls. 3, figs. 2, map 1).—The Gilroy area comprises 199,040 acres and is situated in the southern part of Santa Clara County about 50 miles south of San Francisco. Its topography varies from the comparatively smooth floor of the Santa Clara Valley to rough mountainous country along its eastern and western boundaries. The drainage is in general adequate, though local drainage problems are met with in a number of places, the largest of which, south of Old Gilroy, is annually inundated by Llagas Creek. Only about 1 square mile of the area shows injurious accumulations of alkali.

The present survey reports 19 series of 28 types, the most extensive of which, the Pleasanton gravelly sandy loam, occupies but 5.6 per cent of the total area, together with 4 unclassified groups of muck and peat, rough broken land, river wash, and rough mountainous land, the last-named covering 56 per cent of the area surveyed.

The soil moisture as one of the factors in the organization of rotations [trans. title], A. L. SHATSKIĬ (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus)*, No. 9 (1926), pp. 102-116).—The soil moisture tends to become uniformly distributed and equalized independent of any technical operations. An excess of moisture increases its movement both in the direction of vaporization and underground currents. A lack of moisture retards both processes. On the disintegrated chernozem forest-steppe soils in the region of Stavropol, water begins to accumulate toward the end of the summer independent of the condition of the soil tillage, fallow or not. During the summer neither the fallow nor the cropped soils accumulate water. The moisture relations in the region are not the deciding factor on the yield of winter crops. Fallow has no value from the standpoint of moisture, and the rotation system should avoid it.

Observations on the accumulation and movement of nitrates in a four-field rotation [trans. title], N. MOKIN (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus)*, No. 9 (1926), pp. 22-35).—Experiments conducted on the nitrate content of the various fields showed that in the clean fallow (no vegetation for an entire year) the amount of nitrates was very large, the

greatest accumulation taking place in the fall. During the summer the nitrate content varied with the character and amount of precipitation and with mechanical operations on the soil. Toward spring the fallow lost most of the nitrates. The nitrates were determined in the plowed layer (25 cm.) and down to a depth of 50 cm. in order to follow the leaching of nitrates.

On a corn fallow (corn planted after the land had been in fallow from the previous fall) the amount of nitrates increased beginning with spring and continuing to the middle of summer. From then until the early part of fall the nitrates decreased, only to increase again in the late fall. Again there was quite a large amount of nitrates in the deeper layer (50 cm.).

On a potato fallow the nitrates followed the same course as on the corn fallow. On winter wheat following any kind of a fallow (on land which was in fallow an entire year or which had some crop during the summer) the nitrates did not disappear at any time during the growing season. The accumulation of nitrates noticed on the black, corn, or potato fallow in the late fall persisted even with the winter wheat on the ground.

The conclusion is drawn that clean fallows do not stimulate nitrate accumulation and are therefore not justified in a rational system of agriculture.

Nitrogen-fixation by "Azotobacter chroococcum," S. RANGANATHAN and R. V. NORRIS (*Jour. Indian Inst. Sci.*, 10A (1927), No. 8, pp. 77-96, pl. 1).—Though the part played by Azotobacter in the nitrogen cycle has been the subject of much investigation, the authors note that less attention appears to have been given to the carbon metabolism of this organism. They consider the latter to be the more important of the two, since it is by the oxidation of carbohydrates and like compounds that the organism secures energy for the endothermic reaction of nitrogen fixation. The experiments recorded were designed to illuminate the question raised by the conflicting results of Stoklasa (*E. S. R.*, 20, p. 1115) and of Krzemieniewski (*E. S. R.*, 21, p. 313) and to extend and to investigate further the carbohydrate metabolism and carbon balance of the growth of Azotobacter in artificial media.

Pure cultures having been obtained by subculture and plating methods, the influences of sugar concentration and of phosphates on nitrogen fixation were studied. Carbon balance experiments were made, in which about 70 per cent of the carbon of the dextrose fermented was evolved as carbon dioxide, about 12 per cent was found to have been assimilated by the bacterial cells, and about 18 per cent was left to be accounted for by fermentation products other than carbon dioxide. Tests were made for ethyl alcohol, aldehyde, and formic, acetic, lactic, and tartaric acids, all of which were recognized, and for acetone and acetylmethylcarbinol, which were not found. Quantitative estimations of a number of the fermentation products above noted were made, the character of the nitrogen compounds produced at various stages of the fermentation was investigated and some quantitative determinations made, and some compounds of the Azotobacter cells were determined. Some conclusions drawn from this work were as follows:

The vitality and vigor of Azotobacter cultures were much better preserved in soil extract agar media containing 1 per cent of mannite than in mineral salts mannite agar media. Nitrogen fixation increased in proportion to the amount of sugar fermented, and more than 50 per cent of the total nitrogen fixed was assimilated within the first few days of the fermentation. There was, however, no regular increase in the nitrogen fixation with increasing concentrations of sugar in the medium. Phosphates accelerated the process of nitrogen fixation, but did not lessen sugar consumption. The carbon utilized by the organism could be accounted for within the limits of experimental

error. The first product of nitrogen fixation appeared to be ammonia, this having been apparently gradually worked up into more complex forms of nitrogen through mono- and di-amino compounds. The bacterial cells of *Azotobacter* appeared to contain about 30 per cent of protein, together with a considerable proportion of fat and phosphatides.

Soil microbiology in relation to liming and phosphate fertilization [trans. title], E. E. USPENSKIĖ (Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow]), No. 34 (1926), pp. 65-71).—In a review on the effects of lime and phosphates on the microbial flora of the soil, the author reports investigations on the various phases of this problem, with the following conclusions:

To interpret the rôle of the soil flora, it is not sufficient to determine the nitrates, nitrites, and other products of the life activities of microbes. It is necessary to determine the number of the various forms and their condition.

In order to decipher the problems connected with liming and phosphate fertilization, more attention should be given to nitrifiers, denitrifiers, *Azotobacter*, and *Bacillus mycoides*. The function of the soil protozoa is of secondary importance under field conditions.

With liming and phosphate fertilization the picture of the forms mentioned throws light not only on the useful or harmful transformations of N and P_2O_5 in soil, but it also gives an idea of the general conditions of the soil. In liming soils care should be taken not to overstep too far the neutral point at which *Azotobacter* and the nitrifiers are at their best. With an increase in alkalinity (pH 7.6) the activity of the denitrifiers increases. Attention should be given to determine the number of the forms mentioned on plats with various lime applications.

In the study of the cycle of the phosphate in soils, determinations of the seasonal variations in the microflora due to the time of application of the phosphates are of importance.

Conclusions should not be drawn from qualitative samplings and laboratory work with impure cultures alone.

Manures and fertilizers: Their nature, functions, and application, F. T. SHUTT and L. E. WRIGHT (Canada Dept. Agr. Bul. 92, n. ser. (1927), pp. 64, figs. 5).—This bulletin constitutes a condensed general and popular outline treatment of the properties, functions, and use of manures and other fertilizers and soil amendments, the following being included among the subjects considered: Plant food and soil fertility, farm manures, green manuring, artificial manure, commercial fertilizers, fertilizer formulas and home mixing, fertilizer needs of various crops, lime, gypsum, and peat and muck.

Some observations on the use of animal manure and crop residues, G. ROBERTS (Jour. Amer. Soc. Agron., 19 (1927), No. 11, pp. 1041-1044).—This note from the Kentucky Experiment Station presents a brief report of experiments indicating a depressing effect of crop residues incorporated into the soil upon the yield of an immediately following corn crop, and a failure of this treatment to effect any improvement in later crops, while manure, on the other hand, increased both the corn and other crops in the rotation. It was also found that small quantities of sodium nitrate were as effective under the conditions of these experiments as heavy applications of barnyard manure. These results are considered to support the theory that the addition of organic matter in excess of that accumulated from roots and stubble in a good rotation has no value other than that of the actual plant nutrients so added.

Synthetic farmyard manure, J. A. PRESCOTT and C. S. PIPER (Jour. Dept. Agr. So. Aust., 30 (1927), No. 7, pp. 738-742).—With the use of a well-known commercial starter chemical, wetted straw was successfully rotted down in about six months to yield an artificial manure which gave practically the same

results when applied to potatoes at the rate of 40 tons per acre as did ordinary stable manure applied in the same way.

Production of artificial farmyard manure by fermenting straw, W. V. HALVERSEN and E. F. TOBERGSON (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 7, pp. 577-584, figs. 2).—From 0.5 to 0.75 per cent of nitrogen supplied as ammonium sulfate, together with sufficient lime to prevent the development of acid reaction during the rotting-down process, makes possible, according to this contribution from the Oregon Experiment Station, the production of a satisfactory artificial manure at a cost under local conditions and at the time when the experiments were made of about 80 cts. per ton of the wet product. Under 0.5 per cent of added nitrogen, on the basis of the original dry straw, was found less satisfactory than 0.5 to 0.75 per cent; and 1 per cent or more of added nitrogen did not produce rapid decay. So slight a difference between the effects of 0.5 per cent and of 0.75 per cent of added nitrogen was observed that the smaller of these additions is recommended as the more economical.

The results here recorded were obtained in an outdoor incubation of 6½ months' duration, starting about the middle of March. Wheat straw in galvanized iron tanks and a barley straw stack were successfully treated.

Artificial manure production on the farm, W. A. ALBRECHT (*Missouri Sta. Bul.* 258 (1927)), pp. 20, figs. 11).—In experiments conducted at the station it was found that a mixture containing 45 per cent of ammonium sulfate, 40 per cent of finely ground limestone, and 15 per cent of superphosphate (acid phosphate) produced when applied to straw, 150 lbs. of mixture to the ton, an artificial manure very similar to that obtained with patent chemicals. On a wheat farm in southwest Missouri the chemicals were applied through the thresher, and flat straw piles were made to take the rainfall as water supply for the process. Used as a top-dressing on winter wheat, the resultant manure proved superior to applications of straw and barnyard manure as a means of improving the yield and quality of the wheat and to insure a stand of clover. About 3 tons of the product were obtained from each ton of straw at a cost of less than 85 cts. per ton.

The value of peat as a material for the preparation of peat manure and compost [trans. title], D. N. PRĀNISHNIKOV (*Trudy Nauch. Inst. Udobr.* (Trans. Sci. Inst. Fert. [Moscow]), No. 34 (1926), pp. 72-75).—For the study of the composting of peat the following scheme was adopted: (1) Acid composting with phosphates with the idea of bringing the phosphates into solution, (2) alkaline composting with wood ashes or lime to transform the nitrogen of the peat into available form, and (3) biological composting by means of adding liquid manure. The first two composts are eventually combined and inoculated with liquid manure. The latter has been found to be superfluous, and even alkaline composting was not important. Within two months 10 per cent of the nitrogen from the peat became available and 18 per cent within six months. The results are fragmentary, and no details of methods used are given.

New fertilizers on the market for 1928, C. A. MOOERS (*Tennessee Sta. Circ.* 18 (1928), pp. 2).—This circular very briefly notes the availability of certain of the new highly concentrated commercial fertilizer mixtures, briefly discusses them, and gives suggestions with respect to their use and to their crop and soil adaptabilities.

Relation of fertility to water requirement of plants, W. L. POWERS (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 1007-1011).—Extending previous work on irrigation and the relation of fertilizer treatment to irrigation requirement (*E. S. R.*, 42, p. 575), the author of this communication from the Oregon Experiment Station reports sulfur, calcium sulfate, and potassium sulfate as

bringing about increased yields at reduced water costs on certain Oregon types, including both acid and alkaline arid soils.

Relation between water and potash in plant production, F. W. MORSE, (*Jour. Agr. Research* [U. S.], 35 (1927), No. 10, pp. 939-946).—Pot experiments in which the relation of potash supply to water requirement was studied by means of cultures of Japanese millet and of soy beans are reported in this paper from the Massachusetts Experiment Station. Four series of pots were made up with (1) soil which had had no potash fertilizers for 30 years, (2) the same soil plus added potash, (3) soil which had had potash fertilizers annually for 80 years, and (4) the same soil as in (3) but with added potash; and in each of these series three rates of water supply, described as maximum, medium, and minimum on the basis of the water-holding capacity of the soil, were given.

The natural potash content of the soils used (Merrimac fine sandy loam) having a low solubility, it was found that both the millet and the soy beans secured their potash supply in direct proportion to the water supply. When potash was included in the fertilizer the millet became nearly indifferent to variations in the water supply. The soy beans were found about equally affected by potash and by water supply. The millet appeared the better crop for testing the availability of soil potash because of its lesser sensitiveness to variations in water supply. The results of these experiments appeared to be in agreement with those mentioned by Hall (*E. S. R.*, 40, p. 514) in reporting Rothamsted experiments, and with the opinion of Von Seelhorst (*E. S. R.*, 35, p. 630) that the potash effect is in accord with the law of the minimum.

The absorption of phosphoric acid by soils [trans. title], V. V. GEMMERLING (*Trudy Nauch. Inst. Udobr. (Trans. Soil Inst. Fert. [Moscow])*, No. 34 (1926), pp. 46-50).—Three types of soils, disintegrated chernozem, red soils, and podzolized clay soil, were treated with KCl solution in an attempt to replace the Ca in calcium phosphate, if such is present in the soil. The results showed no phosphoric acid, which should appear as potassium phosphate. A sample of rock phosphate treated with N/1 solution of NaCl gave results indicating that a replacement is possible with a neutral salt. This suggests the supposition that in the soils under investigation no phosphorus was combined with Ca.

The same soils were extracted and leached with a N/4 solution of NaH_2PO_4 , 10 times in succession. After each extraction the filtrate was analyzed for NaH_2PO_4 , Ca, and Mg. Altogether, the chernozem absorbed 0.62 per cent (on the basis of air dry soil), of P_2O_5 , largely in the first two extractions. The red soil absorbed 1.88, and the podzol soil 0.76 per cent. The manner in which the podzol soil absorbed P_2O_5 differed from that of the chernozem and red soils inasmuch as the first extraction did not absorb much P_2O_5 . It gradually increased and then decreased, behaving after that as the other soils.

The Ca and Mg determinations showed that in the three soils investigated less Ca and Mg was replaced with the NaH_2PO_4 as compared with the NH_4Cl treatment. A comparison of the amount of Ca and Mg replaced by the two methods gave a clue as to how the phosphate combines in the respective soils. It was found that in the chernozem 0.576 per cent of P_2O_5 was combined with Ca (and perhaps with Mg) and the rest, 0.044 per cent, with other bases, presumably Al and Fe. In the red soil, only 0.007 per cent of P_2O_5 was combined as $\text{Ca}_3(\text{PO}_4)_2$, the remainder being in combination with Al and Fe. In the podzol only 0.096 per cent of P_2O_5 was combined with Ca, and the rest, 0.662 per cent, with sesquioxides. When the same soils were saturated with NH_4 ions, replacing all other cations, and treated with NaH_2PO_4 , the chernozem soil absorbed 0.196 per cent of P_2O_5 in 3 extractions, the red soil absorbed 0.72 per cent in 1 extraction, and the podzol soil 0.205 per cent in 1 extraction.

The conclusion is drawn that mineral phosphoric acid is not found in the form of $\text{Ca}_3(\text{PO}_4)_2$ in the red and podzol soils, but that in the chernozem soil most of the P_2O_5 is in that form.

The southern limits for the utilization of rock phosphate flour [trans. title], V. V. GEMMERLING (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 31, 32, fig. 1).—From the soil data available the author has compiled a map of Russia showing the regions where raw phosphate rock may be utilized. The southern limit set for raw phosphate is the southern limit of the disintegrated chernozems, and this also takes in the districts of podzolized soils, and gray forest soils. Beyond this limit can be found a series of what may be called "islands," where raw phosphates may successfully be applied. In the Caucasus, also, spots can be found where raw phosphate may be used to good advantage.

A report of the Engel'gardt Agricultural Experiment Station on the use of phosphates [trans. title], V. N. POSTNIKOV (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 33-36).—Experiments with various forms of phosphoric acid in a rotation described as fallow, rye, clover, flax, fallow, rye, and oats, with the P_2O_5 applied in the first fallow, gave the best returns on unsaturated podzol soils with raw rock phosphate. The treatments used included 3 poods of P_2O_5 as superphosphate (acid phosphate) per dessiatine (40 lbs. per acre), 4 poods of P_2O_5 as Thomas slag, 6 poods of P_2O_5 as raw rock, and 2,400 poods of barnyard manure.

Phosphate deposits of the Union of Socialistic Soviet Republics [trans. title], A. V. KAZAKOV (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 78-80).—This is a review of the phosphate resources of the Union of Socialistic Soviet Republics.

Lime and phosphoric acid in soils [trans. title], M. A. EGOROV (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 37-45).—The author constructed a soil sampler consisting of a brass tube with an area of 0.0000001 dessiatine (1.69 sq. in.), 22 cm. long, and divided into segments of 2, 5, 10, 15, and 20 cm. Samples of chernozem soils were taken during the vegetation period, and various chemical determinations were made. The results show that the P_2O_5 and CaO contents do not run parallel; at times the CaO content is larger, at others the P_2O_5 content. It was found that the CaO content is not constant during the various periods of the same day, as toward noon there is an accumulation of soluble CaO. The Ca in the soil has an influence on the amount of substance in suspension.

Experiments were conducted to ascertain the influence of drought on the intake of Ca and P_2O_5 by plants. Contrary to findings ascribed to Nolte, it was found that plants do not accumulate more Ca and less P_2O_5 in dry years.

Report of the Vyatka Regional Agricultural Experiment Station on liming investigations [trans. title], A. L. VELIKOLEPOV (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 59-64).—In a podzol soil the addition of CaCO_3 in the plowed horizon has no influence on the yield of oats or clover. CaO doubled the yield of oats and increased the yield of clover by 33 per cent. The amounts added varied from 0.25 to 1 per cent. When CaCO_3 was added to the subsoil in amounts of 0.125 per cent the yield of clover increased 114 per cent, but larger applications decreased the yield. Vegetation experiments with lime added to the podzolized horizon showed that CaO increased the yield threefold or more, provided the moisture content was kept up.

Simultaneously with the experiments on the effects of lime, a series of experiments was carried out on the effects of drying the soil on the yields.

Both vegetation and plat experiments in the field were conducted, and in each case drying increased the yields twofold or threefold.

The application of lime [trans. title], D. N. PRĀNISHNIKOV (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 34 (1926), pp. 51-54).—This is a review of the subject of the function of lime in soils and the methods for lime requirement estimation.

Inspection of agricultural lime products for the season of 1927, H. D. HASKINS, M. W. GOODWIN, and J. W. KUZMESKI (*Massachusetts Sta. Control Ser. Bul. 42* (1927), pp. 5, fig. 1).—Guaranties and actual analyses of 27 samples of agricultural lime and 3 samples of gypsum collected for inspection in Massachusetts during 1927 are presented.

Analyses of commercial fertilizers, H. E. CURTIS, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Bul. 276* (1926), pp. 527-699).—The usual analyses of the 820 brands of fertilizers and raw materials registered in Kentucky during the year 1926 are presented, with additional analyses of 794 samples collected by inspectors or sent in from various parts of the State.

Commercial fertilizers, 1927, J. M. BARTLETT (*Maine Sta. Off. Insp. 125* (1927), pp. 37-60).—This contains the usual analyses of commercial fertilizers and raw materials collected for the 1927 inspection.

Inspection of commercial fertilizers for the season of 1927, H. D. HASKINS, L. S. WALKER, and M. W. GOODWIN (*Massachusetts Sta. Control Ser. Bul. 41* (1927), pp. 37, pl. 1).—This contains the customary analytical data on commercial fertilizers and unmixed materials, together with the results of a vegetation pot experiment to determine nitrogen availability of processed low-grade materials and activated sewage products.

Commercial fertilizers in 1926-27, G. S. FRAPS and S. E. ASBURY (*Texas Sta. Bul. 368* (1927), pp. 61).—The usual analyses of commercial fertilizers are presented, together with a discussion of the use of fertilizers on different crops and sections of the State.

AGRICULTURAL BOTANY

A contribution to the theory of the relationship of iron to the origin of life, W. D. FRANCIS (*Roy. Soc. Queensland, Proc.*, 37 (1925), pp. 98-107; *Ger. trans. in Bot. Arch.*, 15 (1926), No. 5-6, pp. 377-384).—The possibility of the intimate connection of iron with the origin of life is suggested by inorganic properties of iron or of its compounds, which are indicated in systematic detail. It is thought that some of the chemical processes, such as the oxidation and hydration which iron and some of its compounds undergo in the presence of oxygen and water, might have initiated or may initiate the primitive colloid state of protoplasm, which in its living state is known to be a colloid complex in which several different forms of colloids, as suspensoids, emulsoids, sols, and gels, are present. The chemical principles of these two processes of oxidation and hydration, primary factors in the production of the colloid state from iron, are fundamental factors in the maintenance of life.

Carbohydrate variations [in corn] (*South Dakota Sta. Rpt. 1927*, pp. 4, 5).—In continuation of studies of carbohydrate variations in leaves and husks of corn (E. S. R., 56, p. 627), series of cultures were carried through the greenhouse and field, and determinations were made of carbohydrates from the leaves. The results are said to indicate that percentages of sugar and starch taken at 3-hour intervals during a period of 2 days were distinctly affected by the factors of light and temperature. The lowest percentage of sugar was present in the leaf samples taken at 1 a. m., with fairly regular increases toward earlier and later parts of the 24-hour period.

Growth studies.—V, Factors affecting the development and form of leaves, W. H. PEARSALL and A. M. HANBY (*Ann. Bot. [London]*, 40 (1926), No. 157, pp. 85–103, figs. 3).—The development of some typical palmate leaves is considered in relation to water supply and internal hydrostatic pressures, and evidence is presented showing that negative hydrostatic pressures cause leaf growth to check or stop, and favoring the assumption that rapid growth is usually associated with positive hydrostatic pressure. After treatment with negative or reduced pressures, palmate leaves become smaller and more dissected and show reduced basal lobes when compared with similar leaves after positive pressure treatment. There is evidence that when the angle between a lateral vein and the main vein of a palmate leaf approaches or exceeds 90° the water supply to the lateral vein becomes reduced, and a possible explanation is discussed.

Previous papers of the series have been noted (E. S. R., 52, p. 217).

The changes induced in the anatomical structure of *Vicia faba* by the absence of boron from the nutrient solution, K. WARINGTON (*Ann. Bot. [London]*, 40 (1926), No. 157, pp. 27–42, figs. 9).—The anatomical structure of the stem of *V. faba* grown in a nutrient solution containing a small quantity of boric acid (1:2,500,000) is normal, but if boron is omitted from the nutrient solution the structure of both stem and root becomes abnormal in ways which are indicated. It is concluded that a definite connection exists between the presence or absence of boron and the anatomical structure. The correlation of this connection with the meristematic activity of the plant is discussed.

On the effect of light and other conditions upon the rate of water-loss from the mesophyll, F. Y. HENDERSON (*Ann. Bot. [London]*, 40 (1926), No. 159, pp. 507–533, figs. 8).—In studies carried out by means of a special apparatus, which is described, it was found that in transpiration the response of the mesophyll to ordinary external conditions is masked by the action of the stomata. The stomata, however, can be rendered inoperative by the slitting method, so that the direct effect of external conditions on water loss from the mesophyll can be studied.

The large increases in transpiration rate (10 to 100 per cent) ascribed by Darwin (E. S. R., 31, p. 222) to the direct effect of light on the mesophyll were not observed. Electric light of the same intensity as diffuse daylight increased the mesophyll water loss by about 5 per cent, of which about 1 per cent is due to heating. A direct action of light on the rate of water loss from the mesophyll cells has thus been established. Very feeble light has no appreciable effect on transpiration, but with increasing intensities the water loss rate rises, though soon reaching a maximum. With intermittent light a factor other than intensity comes into play, a gradual increase in the effect being observed with an increase of the rate of intermissions from 300 up to 2,000 per minute, although the amount of radiation falling on the leaf remains the same. An after-effect of the light which continues into the dark period is thus indicated. The mesophyll reacts to humidity changes in a way similar to that of a damp inert surface.

The leaf temperature in ivy, *Eupatorium adenophorum*, and *Aster* sp. in gently moving air, diffuse light, and laboratory temperature and humidity is lower than that of the surrounding air. As humidity or light intensity increases, however, the leaf temperature rises to a higher value, which may be above that of the air. Mesophyll water content is important in determining transpiration rate. The nature of the light response of the mesophyll is discussed, and it is suggested that the most plausible explanation is the effect of light on the permeability of the protoplasm to water.

The response of certain photoperiodic plants to differing temperature and humidity conditions, B. E. GILBERT (*Ann. Bot. [London]*, 40 (1926), No. 158, pp. 315-320, figs. 2).—In this experiment, in which certain plants known to react to relative day length were subjected to two sets of temperature and humidity conditions, marked results were obtained as regards modification of the length of the vegetative activity. According to species, one set or the other proved to be more effective in modifying the response to relative day length. Soy bean and cotton gave definite reactions to the higher temperature and lower humidity conditions. *Cosmos* sp. was also definite in its reaction, but it flowered much earlier and more normally under the lower temperature and higher humidity conditions. *Salvia* sp. and buckwheat exhibited no reaction to the temperature and humidity conditions used in this experiment.

Movement of *Mimosa pudica* as affected by anaesthetics and other substances, D. A. HERBERT (*Roy. Soc. Queensland, Proc.*, 37 (1925), pp. 121-147).—*M. pudica* may show injury response in part of a leaf while other parts to which the stimulus has been transmitted show shock response only. Confusion of these two types is to be avoided in studying the effects of a reagent. The effects are indicated of chloroform, ether, ammonia, formalin, nitrous oxide, carbon disulfide, and benzene.

"The term anaesthesia, in so far as it implies a suspension of sensibility to external impressions, can not be applied to the effect of ether and chloroform on *M. pudica*."

Bilateral symmetry in the geotropism of certain seedlings, E. D. BRAIN (*Ann. Bot. [London]*, 40 (1926), No. 159 pp. 651-664, pl. 1, figs. 5).—Details are given regarding the behavior in the dark or on a revolving klinostat of *Lupinus polyphyllus* and other seedlings named. It is considered probable that response to geotropic stimulation is related to the shape of the cross section of the hypocotyl and the symmetry of the vascular tissue in that part of it which responds by curvature.

Reflection of light from the surfaces of leaves, C. A. SHULL (*Science*, 67 (1928), No. 1726, pp. 107, 108).—The author reports measurements of the reflection of light from leaf surfaces made by a direct reading spectrophotometer. Measurements were made at intervals of about 20μ across the spectrum, and the reflection of both surfaces of green leaves of lilac, mulberry, and white poplar, and of autumn colored leaves of Virginia creeper and white birch was determined.

The greatest reflection from green leaves was between 540 and 560μ , and it varied from 6 per cent for dark green leaves of lilac to 20 per cent for light green leaves of white poplar. In the bright autumn colored leaves the greatest reflection of light occurred in the brighter portions of the spectrum, 40 per cent of this light being reflected in the case of birch leaves.

As a result of his investigations the author concludes that measurements should be made of reflected light in experiments conducted to determine the energy relations of leaves.

A convenient method of measuring quantities of chloroplast pigments, H. B. SPRAGUE (*Science*, 67 (1928), No. 1728, pp. 167-169).—A preliminary description is given of a method used for estimating the chloroplast pigments. The method is based on comparisons with artificial color standards, making use of a Duboscq colorimeter. It is said that the materials and equipment are inexpensive, that the method is rapid and fairly accurate, and that the standard solutions used for comparison will keep for many months without deterioration.

The extraction of sap from living leaves by means of compressed air, A. C. CHIBNALL and C. E. GROVER (*Ann. Bot. [London]*, 40 (1926), No. 158, pp. 491-497).—Having had occasion to use the Dixon and Hall apparatus

(E. S. R., 53, p. 223), the authors found that the sap exuded from the shoots contained both organic and inorganic materials in solution. The major portion of the sap was supposed to have been forced out of the leaves. The question is discussed evidentially whether the dissolved material came from the leaves or whether it was washed out of the vessels of the stem by the water current from the leaves.

The growth of *Bacillus radicola* on artificial media containing various plant extracts, F. E. ALLISON (*Jour. Agr. Research* [U. S.], 35 (1927), No. 10, pp. 915-924).—The effect of various plant extracts on *B. radicola* from red clover in synthetic media is described. The production of zoogloea films as described by Dawson (E. S. R., 12, p. 311) was taken as the measurement of growth.

Extracts prepared from 26 different plant materials, including vegetables, fruits, and field crops, increased bacterial growth to some extent, at least when used in the proper concentration, but the activity varied widely for different plants and for different parts of the plants. Extracts of legume roots were found to particularly favor the growth of *B. radicola*. Of the nonlegume extracts, the best were from lettuce, cabbage, carrot, spinach, tomato, green corn tops, bluegrass, and orange.

These studies are considered to show definitely that there is a wide difference in the response of various strains of legume bacteria to plant extract media. Of 30 strains taken from as many species of plants, the clover-alfalfa group of organisms gave the largest increases in growth.

In one series of experiments nitrogen in the form of potassium nitrate was added to the culture flasks containing plant extracts and synthetic media. The growth was usually increased, and in no case was there any injury, regardless of the quantity of nitrogen added. The growth in the presence of the extracts of some plant products, like clover seed and alfalfa seed, which contain an abundance of nitrogen, was greater with the nitrogen added.

Strain variations and host specificity of the root-nodule bacteria of the pea group, G. E. HEIZ, I. L. BALDWIN, and E. B. FRED (*Jour. Agr. Research* [U. S.], 35 (1927), No. 11, pp. 1039-1055, figs. 6).—The relative efficiency of a number of strains of nodule bacteria derived from pea nodules and cultures and *Vicia* cultures was studied at the University of Wisconsin on peas, horse beans, hairy vetch, sweet peas, and lentils. Differences were noted in the ability of strains of pea nodule organisms to aid the host plant. One of the strains produced nodules on all of the host species studied but did not benefit the plant. In general, cultures which were beneficial to their host plants produced large nodules on the taproot or other upper roots of the plant, while those cultures which were not so beneficial formed small nodules scattered throughout the root system. A culture originally isolated from *V. faba* produced better results on *V. faba* than did a culture originally isolated from peas, whereas the pea culture gave much better results on both peas and sweet peas than did the *V. faba* culture.

On the relation of certain soil algae to some soluble carbon compounds, B. M. B. ROACH (*Ann. Bot.* [London], 40 (1926), No. 157, pp. 149-201, pl. 1, figs. 13).—In the first part of this paper a method is described for obtaining pure cultures of algae from the soil. In pure cultures of soil algae on solid media, most species show greatly increased growth in the presence of a number of different soluble organic compounds. Each species usually shows its own order of selection of the compounds tested, though a few species do not so behave, these being possibly completely autotrophic in nutrition.

In the second part of this work a method is described by which the growth of the alga *Scenedesmus costulatus chlorellioides* n. v. has been studied quan-

ratively in liquid media containing mineral salts with 1 per cent of certain soluble organic compounds. Details of this study are given, with quantitative expression of the average rates of growth in the different media. The data show that in media completely favorable to its growth the bulk increase of *S. costulatus chlorelloides* follows for a limited period of time the same laws as a simple exponential curve.

The uredo stage of the Pucciniastreae, E. H. MOSS (*Ann. Bot. [London]*, 40 (1926), No. 160, pp. 818-847, pl. 1, figs. 21).—It is stated, as a general conclusion to this work that, though on the basis of supposed differences in uredosori certain earlier investigators have proposed a division of the Pucciniastreae into two groups, those on ferns and those on flowering plants the uredo stage provides no criteria for a natural grouping of this kind.

GENETICS

Genetics in relation to agriculture, E. B. BARCOCK and R. E. CLAUSEN (*New York and London: McGraw-Hill Book Co., 1927, 2. ed., rev., pp. XIV+673, pls. 4, figs. 203*).—The revision of this book (E. S. R., 39, p. 671), bringing in the advances in the subject, has necessitated an almost complete rewriting of the text. Part 1, dealing with the fundamentals of genetics, is divided into introduction, physical basis, heredity, and variation, while parts 2 and 3 deal, respectively, with plant and animal breeding.

Y-chromosome inheritance: A review, R. C. ROBB (*Amer. Nat.*, 61 (1927). No. 677, pp. 568-571).—The references to cases of Y-chromosome inheritance in *Lebistes*, *Aplocheilus*, *Lymantria*, *Phytodecta*, *Melandrium*, and *Drosophila* are briefly noted.

A cytological and genetical study of progenies of triploid tomatoes, J. W. LESLEY (*Genetics*, 13 (1928), No. 1, pp. 1-43, figs. 25).—Triploid plants found in three varieties of tomatoes, Dwarf Aristocrat, Dwarf Champion, and Stone, are believed to have originated from the fusion of diploid and haploid gametes. In general, trisomic types were slower growing and showed a greater tendency to pollen sterility and low fruitfulness than did normal diploid types, indicating that unbalance in terms of chromosome number has an important influence on growth. Crosses between triploid and diploid plants gave rise to a series of variant types. In the F_1 generation chromosome numbers did not have a binomial distribution but ranged from 24 to 27, with the smaller seeds yielding more 26- and 27-chromosome plants than did the larger seeds. Of two plants obtained from a diploid by triploid cross both were diploid.

Studies of the inheritance of self and cross-incompatibility, A. B. STOUT (*Mem. Hort. Soc. New York*, 3 (1927), pp. 345-352, pls. 2, fig. 1).—Work in five genera of plants, *Lilium*, *Brassica*, *Linaria*, *Clitorium*, and *Hemerocallis*, led the author to question whether strains of plants which are propagated from seed and which are fully self-sterile exist or can be isolated by selection. Whenever a large number of plants of a self-incompatible species are grown in a pedigreed line, self-compatible plants appear even after several generations of selection. On the other hand, continued selection of self-compatible plants fails to develop fully self-compatible strains. For example, selections by the author for seven generations failed to increase greatly the percentage of self-compatible individuals in a strain of *B. pekinensis*, even though the most highly self-compatible plants were always saved as parents. The phenomenon of cyclic sterility displayed in *B. pekinensis* suggests a biogenetic control of the assumed factorial organization of the germ plasm. The inconsistencies observed in the inheritance of compatibility and incompatibility led to the suggesting of the conception that the self- and cross-incompatibilities in plants are determined

by complex chemical compounds which are sufficiently labile to permit their passing readily through series of changes which are characterized by varying degrees of stability.

Mutation in fungi, O. A. PLUNKETT (*Phytopathology*, 16 (1926), No. 10, pp. 762, 763).—A study of 39 species of fungi belonging to 18 genera has shown a number of mutations in *Alternaria*, 2 mutants of *Sterigmatocystis niger*, 5 of *Colletotrichum lagenarium*, and 3 of *Glomerella cingulata*. All the mutants were permanent in character and did not revert to the original form even when grown for a long time on their normal host.

The genetics of the potato [trans. title], T. V. ASSEVA (*Moskov. Oblastn. Sel'sk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.]* 16 (1926), pp. 62, pl. 1, figs. 5).—Genetic investigations with potatoes at the Korenev Potato Breeding Station are reviewed, with descriptions of the material and technique. The inheritance of the colorations of tubers, eyes, and sprouts, and spotting is discussed under several headings.

✓ **The genetic nature of the lateral spikelets of barley** [trans. title], M. G. VEIDEMAN (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant-Breeding)*, 17 (1927), No. 2, pp. 3-70, figs. 8; *Eng. abs.*, pp. 65-67).—Microscopic and genetic studies led to the conclusion that the sterility of the lateral florets which occurs in certain races of barley is the natural consequence of adverse conditions of nutrition, caused by the lateral spikelets having long, thin pedicels. Thus fertility in this case does not appear to be an independent hereditary character, although the pedicel of the lateral spikelets is described as such.

✓ **Inheritance of fluctuating characters in pedigreed lines of wheat** [trans. title], F. MOREAU and A. DUSSEAU (*Ann. Sci. Agron. Franç. et Étrang.*, 44 (1927), No. 4, pp. 321-332, figs. 5).—Data recorded on the average number of spikelets, length of rachis, density of spike, and weight and number of kernels in spikes selected from pure lines of wheat and in their progeny gave no indication that wheat could be improved by selection within the pure line.

✓ **Interspecific hybridization in *Nicotiana*** [trans. title], S. A. ÉGTZ (EGHS) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 151-189, figs. 23; *Eng. abs.*, pp. 184-189).—Morphological and cytological differences between *N. tabacum* and *N. rustica* are described, together with accounts of the genetic and cytological behavior of hybrids between these species and between such hybrids and the parents or other species of *Nicotiana*.

✓ **Polyploid hybrids of *Nicotiana tabacum* L. × *N. rustica* L.** [trans. title], V. A. RYBIN (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 191-240, pl. 1, figs. 28; *Eng. abs.*, pp. 235-240).—These pages report cytological studies made on the parent species and on two of the hybrids secured in the study reported above.

✓ **The production of variation in *Nicotiana* species by X-ray treatment of sex cells**, T. H. GOODSPEED and A. R. OLSON (*Natl. Acad. Sci. Proc.*, 14 (1928), No. 1, pp. 66-69).—Mature plants of *N. tabacum purpurca* bearing flower buds of all ages up to anthesis were X-rayed in January at the University of California, and equivalent plants were treated in September. Variants comprised more than 20 per cent of the plants which grew from seed produced in the capsules from the January X-rayed buds permitted to self-pollinate. The variants generally showed striking alteration in one or more of the external morphological characters distinguishing the species. Complete sterility in the variants was rare, and many showed complete fertility. The early growth stages of plants from the September X-rayed seed promised similar variants. Thus a method

apparently exists for producing at will an extensive series of variations in *N. tabacum*, it being necessary to expose to X-rays only the male sex cells. Studies of 15 variants of the January group showed cytological abnormalities in about one-half of the cases. The response of *N. rustica pumila*, *N. bigelovii wallacei*, *N. suaveolens*, and *N. nudicaulis* to similar X-ray treatment is described briefly.

Progenies from X-rayed sex cells of tobacco, T. H. GOODSPEED and A. R. OLSON (*Science*, 67 (1928), No. 1724, p. 46).—A shorter account of the work noted above.

Genetic effects of X-rays in maize, L. J. STADLER (*Natl. Acad. Sci. Proc.*, 14 (1928), No. 1, pp. 69–75).—X-ray treatment (E. S. R., 57, p. 425) at the time of the maturation divisions in young tassels of corn plants of families heterozygous for C-Sh-Wx at the Missouri Experiment Station failed to affect the crossover frequency appreciably. In a study of the frequency of mosaic endosperms involving C, Wx, I, R, Su, Y, and Pr, ears were X-rayed at or shortly before fertilization. The percentage of mosaic endosperms in the X-rayed series as a whole was more than 20 times as large as that in the untreated series.

Altering a matured genetic character, R. T. HANCE (*Jour. Heredity*, 18 (1927), No. 3, pp. 377–380, figs. 3).—A brief account is given of experiments in which the coat color of agouti mice was changed to white as a result of X-ray exposure. It is suggested that either the chromogen or the oxidase, the two factors responsible for melanin pigment, have been destroyed. Evidence indicated that the source of supply of the enzyme tyrosinase was destroyed, as the induced white color was permanent.

Some sterile and fertile plant hybrids, N. E. HANSEN (*Mem. Hort. Soc. New York*, 3 (1927), pp. 229–232).—Stating that homozygous plant material yields more fertile hybrids than does heterozygous, the author cites the results of various species crosses at the South Dakota Experiment Station and discusses briefly the results of work with alfalfa and apples.

Seed production in sterile citrus hybrids: Its scientific explanation and practical significance, W. T. SWINGLE (*Mem. Hort. Soc. New York*, 3 (1927), pp. 19–21).—The Rusk and other varieties of citranges were found upon pollination to produce viable seed which on germination yielded seedlings which in growth and fruiting were almost exactly like the ovule parent. The phenomenon is ascribed to the development of supernumerary embryos produced by buds growing out from the nucellar tissues. True F₁ seedlings were produced by only two varieties, Phelps and Sanford.

Concerning the sterility of phanerogamic plants (French studies), D. BOIS (*Mem. Hort. Soc. New York*, 3 (1927), pp. 377–397).—Translated from the French by I. Hein, of Columbia University, this paper presents a general discussion of plant sterility, enumerating the various internal and environmental conditions which affect or cause sterility and directing attention to the situation in various species. A section of the paper entitled Sterility of Fruit Trees in France and in Morocco (pp. 392–394) presents the results of sterility and cross-pollination studies with a large number of pear, apple, cherry, and plum varieties. It is interesting to note that the Baldwin apple and the Bartlett pear are recorded as self-fertile.

Correlation and cyclic sterility in Cleome, A. E. MURNEEK (*Mem. Hort. Soc. New York*, 3 (1927), pp. 65–72).—The material presented in this paper has for the most part been previously noted (E. S. R., 58, p. 129).

Relationship of polyploidy to pollen sterility in the genera *Rubus* and *Fragaria*, A. E. LONGLEY (*Mem. Hort. Soc. New York*, 3 (1927), pp. 15–17).—Observations on an extended number of wild species and horticultural forms showed a well-defined association between even chromosome number and the pro-

duction of fertile pollen in *Rubus*, and reciprocally a relation between odd numbers and sterile pollen. *Rubus* forms with a high percentage of sterile pollen are believed to have originated from a union of distantly related sex cells with different chromosome number. In *Fragaria* all diploid forms are hermaphroditic, and dioeciousness is associated with polyploidy.

The heredity of self-sterility in *Veronica syriaca*, E. LEHMANN (*Mem. Hort. Soc. New York*, 3 (1927), pp. 313-320, pls. 3).—Studies with *V. syriaca*, a species found by the author to be uniformly self-sterile, suggest that self-sterility in this species is inherited through different multiple allelomorphs which inhibit or accelerate the rate of growth of the pollen tubes through the style.

A sire's breeding index with special reference to milk production, H. D. GOODALE (*Amer. Nat.*, 61 (1927), No. 677, pp. 539-544).—A suggested breeding index for sires is discussed, which is based on studies of other investigators of the inheritance of milk and fat production in breed crosses in which the F_1 offspring have been found to be intermediate and at a point approximately seven-tenths of the difference between the smaller-producing and the higher-producing parent in milk, while the fat percentage is four-tenths of the difference above the lower-producing parent. Where the daughter's milk production is higher than the dam's, the sire's index is (daughter's production—dam's production) $\frac{1}{2}$ + dam's production. When the dam's record is greater, $\frac{1}{2}$ is used as the multiplier for milk, and 2.5 and 1.7 are the multipliers for fat percentage when the dam's record is higher and lower, respectively.

The application of this method to dairy records is pointed out, and its use in other multiple factor cases is suggested.

Twin and triplet birth ratios: The inter-relations of the frequencies of plural births, R. L. JENKINS (*Jour. Heredity*, 18 (1927), No. 9, pp. 387-394, figs. 10).—Studies of the occurrence of multiple births in various populations showed that the frequency of multiple births increased with the age of the mother up to 35 to 40 years, and then fell off rapidly. This, however, was not true for monozygotic twins, which did not appear to be affected by age.

Studies of available birth statistics indicated that the frequency of production of triplets by mothers of any age could be predicted by the square of the proportion of births which were twins, from which the following formula was derived for estimating multiple births: $T = \Sigma P^2 N$, in which T is the number of triple pregnancies, P is frequency of twin pregnancies, Σ is a function of the age of the mother, and N the number of pregnancies of mothers of the same age. For quadruplets and quintuplets the third and fourth powers of P were used. Determinations by this formula showed relatively close agreement in the cases tried.

In further studies of the effect of previous pregnancies, it was found that for a constant age of mother, twin pregnancies increased with an increase of previous pregnancies.

Differences between the calculated and observed values for quadruplets and quintuplets are explained as due to a greater mortality in multiple births.

The effects of alcohol on birth weight and litter size in the albino rat, F. B. HANSON and F. HEYS (*Amer. Nat.*, 61 (1927), No. 677, pp. 503-519, fig. 1).—The birth weights and size of litter of rats treated in ten generations with alcohol (*E. S. R.*, 57, p. 28) are presented, and compared with the birth weights and size of litter of the control stock originating from the same source. The differences in birth weights between treated and control rats in the third generation was 5.78 times the probable error, and 5.71 times the probable error in the sixth generation. Otherwise the differences were not significant. It

was also found that the third and sixth generations showed increases in the size of litter as a result of treatment which were probably sufficient to cause the decreases in birth weight. The size of litter was higher for the treated stock in all generations except the second.

Differences in the findings of MacDowell (E. S. R., 48, p. 366) are also discussed.

Spectral analyses of hair color [*trans. title*], L. KRÜGER (*Züchtungskunde*, 3 (1928), No. 1, pp. 20-34, figs. 10).—The results of spectral analyses of the hair color of man, horses, cattle, swine, and dogs are presented.

FIELD CROPS

[Field crops work at the Georgia Coastal Plain Station, 1926], S. H. STARR (*Georgia Coastal Plain Sta. Bul.* 8 (1927), pp. 7-36, 41-44, 52-55).—Experiments with field crops reported on in these pages included variety tests with wheat, oats, rye, corn, cotton, peanuts, soy beans, millets, velvet beans, winter field peas, vetch, bur clover, and miscellaneous legumes, potatoes, sweet potatoes, and tobacco, and pasture studies. Crop varieties outstanding over periods were generally those indicated in the previous report (E. S. R., 56, p. 523).

The optimum period for sowing small grains continued to be from October 15 to November 1, with a 6-pk. acre rate indicated for wheat. Although oats appeared to need plenty of phosphorus and also potassium, it did not respond to lime with yield increases. For top-dressing nitrogen applied in the spring, best about February 1, gave better results than nitrogen at planting, and 100 lbs. of sodium nitrate per acre or its equivalent of other quickly available nitrogen fertilizers has given good results. Fifty lbs. of potassium chloride or its equivalent appeared to supply the potassium needed by oats on the heavier soils.

Fertilizer tests with cotton again indicated a 9-3-5 formula to be most efficient on Tifton sandy loam, with slightly more nitrogen and potassium on lighter and poorer soils, and that on good soils from 800 to 1,000 lbs. per acre of this formula may be applied. Sodium nitrate and ammonium sulfate have resulted in considerably heavier yields than were due to slowly available organic forms of nitrogen. Inorganic sources should evidently supply from 50 to 60 per cent of the nitrogen, with the remainder from organic sources. Potassium sources differed little in their effect on cotton, although in previous years potassium from kainit has produced slightly more cotton than potassium from other sources. Cotton may be profitably top-dressed during its earlier growth stages with from 100 to 125 lbs. of quickly available nitrogenous fertilizer. Substantial increases resulted from the use of a green manure or cover crop, but none followed liming. Only small differences were observed in comparison of highly concentrated fertilizer mixtures v. less concentrated formulas. Spacing tests suggested that the highest yields may be expected from two stalks per hill spaced from 12 to 15 in. in the row. Of six methods of applying calcium arsenate to control boll weevil, early poisoning with the home mixture of molasses, calcium arsenate, and water followed by calcium arsenate dust when needed resulted in 1,122 lbs. of seed cotton per acre, although all methods resulted in appreciable yield increases. The method of applying calcium arsenate will be largely determined by the equipment available on the farm.

Few of the corn varieties showed resistance to weevil damage. Type of husk had more influence on such injury than did hardness of grain, corn with husks of fine texture well over the ear tips and lying closely to the ear showing less

damage than those with coarse, open husks not covering the ear well. A 10-2-4 fertilizer formula has given excellent results with corn on Tifton sandy loam or red pebble soils, with a slight increase desirable in the nitrogen and potassium on the lighter soils. Fertilizers should evidently be applied as a side-dressing on good soils and at planting on the poorer lands. Appreciable increases were had from green manure in combination with complete fertilizer.

Although peanut varieties responded to 250 lbs. per acre of superphosphate (acid phosphate) with appreciable yield increases, other results indicated that they should receive a complete fertilizer, a 10-2-4 formula being suggested for all soils, with certain increases in the nitrogen and potassium on the poorer lands. Liming was of slight benefit under peanuts on well drained ridge land, although beneficial results may be expected on lower lying soil, sour and poorly drained. Six-in. spacing has given the highest yields.

Pasture tests indicated that on mixed seedings on moist lowland sods may be obtained which will carry from 1 to 1.5 mature animals per acre. Carpet grass has surpassed lespedeza and Dallis grass in establishing sods on moist lowlands where native vegetation grows profusely, although the combination of the three was superior to any one alone.

Porto Rico, Nancy Hall, and Big Stem Jersey in order led the commercial varieties of sweet potatoes in the production of No. 1 roots for the early market. The high yields resulting from early plantings, April plantings excelling, rapidly decreased with advance of the planting season. Harvesting dates from July 1 to November 1 showed that the sweet potato grows gradually throughout its entire growing period, and that with favorable seasonal conditions root development continues as long as the vines remain green and healthy. Although the closer spacings resulted in decided increases in total yields, very little difference was found in the yields of marketable sweet potatoes in spacings from 4 to 20 in. in the row, and 3-ft. rows showed to the best advantage. The fertilizer formulas, 8-0-2, 8-4-4, and 8-2-6 produced the highest yields during 5 years, and 800 lbs. appeared to be the most profitable application rate. Indications were that the nitrogen should come from both quickly and slowly available sources. With both Porto Rico and Big Stem Jersey consistent increases in yield resulted from increased fertilizer rates, from 300 to 700 lbs. Comparative tests showed that the total yield from whole sweet potatoes has considerably exceeded that from vines or draws, whereas the yield of No. 1 sweet potatoes has been less. The high production of jumbos, about 70 per cent of the total yield, from whole sweet potatoes seemed due to the fact that the whole sweet potato when planted resumes its growth and develops into rough, irregular, oversized sweet potatoes, and very few new sweet potatoes are formed. The 5-year average percentages of rot of 16 sweet potato varieties in storage are tabulated.

The highest potato yield may evidently be expected from plantings between March 15 and April 1 and an 8-4-4 fertilizer has led the formulas, with about 800 lbs. as the most profitable application rate on Tifton sandy loam. While both overhead and subirrigation gave substantial yield increases, the overhead required less water and appeared to be better adapted to conditions. Although the larger seed pieces gave the higher yields, the increased seed cost made them unprofitable. Appreciable difference in yields were not observed in a comparison of seed ends and stem ends.

Fertilizer and variety experiments with tobacco have been summarized elsewhere (E. S. R., 57, p. 433; 58, p. 328). Studies on the control of nematodes and root knot infesting tobacco by rotations and selection are discussed briefly.

Report of experimental work in McClain County, H. C. PORRS (*Oklahoma Sta. Bul. 170* (1928), pp. 8).—Cooperative experiments reported on for 1925,

1926, and 1927 included variety tests with corn, grain sorghum, sorgo, oats, cotton, soy beans, cowpeas, and mung beans, and fertilizer and planting tests with cotton.

[Crop studies in South Dakota] (*South Dakota Sta. Rpt. 1927*, pp. 5, 6, 8).—Quack grass has been successfully controlled at the station in a 4-year rotation of corn, oats, wheat, and sweet clover harvested for hay, and the land intensively summer fallowed. The relative merits of the grain system v. the livestock system of farming are noted.

Prolonged selection within a corn strain for high protein content appeared to result in reduced acre yields. Differences in corn yields were not of economic importance in a comparison of several depths of plowing.

Considerable variation was noted between strains of flax. Flax did not appear to exhaust soluble constituents of the soil more rapidly than other crops.

A short report of the work on the experimental fields of the region in 1925 in connection with the experiments of former years, 1921–1924 [trans. title], S. S. GERKEN (*Moskov. Oblastn. Selsk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.] 17 (1927)*, pp. 116, figs. 19).—Experimental activities reported on included tillage and fertilizer tests, trials of cropping systems involving different crop sequences, fallow, fertilizers, and cultural methods, tests of crops and crop mixtures, and pasture studies.

Keys for the classification of grasses and legumes in the blossomless stage [trans. title], E. HENNING (*Svenska Betes och Vallför. Årsskr.*, 9 (1927), pp. 5–42, figs. 55).—The vegetative organs of grasses and legumes are described and are discussed as a basis for the classification of the different genera and species. Keys based on the characters of the vegetative organs are presented.

[Critical moisture periods for wheat and barley], A. I. A. MOLIBOGA (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant-Breeding)*, 17 (1927), No. 2, pp. 183–202, figs. 3; *Eng. abs.*, pp. 201, 202).—Marquis wheat, grown in pots and subjected to wilting during the tillering, shooting, heading, or milk stages and receiving normal moisture thereafter, suffered most in grain yields when moisture was withheld in the heading and shooting stages, whereas withholding water in the tillering stage seemed to result in yield increases. Barley, evidently more drought resistant, suffered significantly in yield only when wilted in the heading stage. When plants received insufficient moisture (30 per cent) and were subsequently watered to the optimum at one of the periods, increased yields were had in all series except in the milk stage. The maximum effect was obtained by moistening in the shooting stage. The critical period appeared to be the time preceding exsertion of the spike.

The influence of geographical factors on the hulledness of barleys [trans. title], V. P. KOZLOV (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant-Breeding)*, 17 (1927), No. 2, pp. 169–181; *Eng. abs.*, pp. 172, 173).—Hulledness (weight percentage of glumes in dry grain) was studied in pure lines of *Hordeum vulgare* and three races of *H. distichon* grown on experiment stations in different parts of the Union of Socialist Soviet Republics. The slight fluctuations according to geographical stations and the noticeable differences between the several races indicated that hulledness in barley is a stable hereditary character which does not respond to geographical factors in the first year of seeding.

The species of Beta [trans. title], V. A. TRANSHIEL (W. TRANZSCHEL) (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant-Breeding)*, 17 (1927), No. 2, pp. 203–224, figs. 24; *Ger. abs.*, p. 221).—A revision of Beta spp. is suggested, the species being placed in three groups which differ in geographical distribution and in morphological characters.

✓ **Corn Breeding**, F. D. RICHEY (*U. S. Dept. Agr. Bul. 1489 (1927), pp. 64, pls. 12, figs. 8*).—The merits of different systems of corn improvement are discussed under the headings of mass selection, ear-to-row selection, hybridization, and selection within selfed lines. The principles on which corn breeding is based, i. e., those involved in reproduction and inheritance in corn, are considered in some detail. Seventy-eight references are included.

Experiments with the nutritional area of the cotton plant in 1925–26 [trans. title], N. F. DEREVITSKIĖ (N. T. DIEREVITZKY) and I. IŪ. STAROSEL'SKIĖ (I. Y. STAROSELSKY) (*Trudy Azerbaidzhansk. Tsent. Selsk. Khoz. Opytn. i Selekt. Sta. (Works Azerbaijan Cent. Agr. Expt. and Plant-Breeding Sta.), No. 2 (1927), pp. 51, pl. 1, figs. 16; Eng. abs., pp. 7, 12, 27, 33, 34, 38, 43, 44, 45, 49, 50, 51*).—Spacing experiments with cotton dealt with the size of the nutritional area per plant, which ranged from 1 to 37 units. The relations of the spacing to yield are expressed by formulas.

Environmental factors, such as seasonal conditions and soil fertility, seemed to affect the results as much as did the variety. With increase in density of plants per unit area came decreases in the percentage of fruit formation on all fruiting branches, number of bolls per plant, size of boll, and weight per seed; increases in the percentage of total yield before first frost, lint percentage, and earlier maturity; and no alteration in the number of nodes to the first fruiting branch or in the length of fiber.

Varieties of cotton in the red prairies of northwest Texas, J. R. QUINBY (*Texas Sta. Bul. 366 (1927), pp. 19, figs. 4*).—Varietal trials with cotton near Chillicothe, Tex., during the period 1919 to 1926, inclusive, demonstrated that varieties which have the greatest possibility in the section have fairly early maturity, medium-sized bolls, a high lint percentage, and lint not longer than $1\frac{1}{8}$ in. Acala, Kasch, and Mebane led over the whole period, while Half-and-Half, Texas Station Mebane strains, and Kasch and New Boykin, both Mebane type varieties, led during the 3 years, 1924–1926.

Varieties of cotton for east central Texas, D. T. KILLOUGH and G. T. MCNESS (*Texas Sta. Bul. 369 (1927), pp. 52, figs. 2*).—Variety trials with cotton at the station during the period 1912–1926 indicated that in general the sorts originated from Mebane, i. e., New Boykin, Mebane, Cliett, and Kasch; and Truitt; Lone Star; Rowden; and Acala are well adapted to that part of east-central Texas. Considering yield and lint length, Mebane, Belton, Lone Star, Truitt, and Acala surpassed in order other sorts in comparative acre value, although New Boykin and Snowflake led during the periods in which they were included. Correlation studies indicated that increase in lint yield may be accompanied by increase in lint percentage and in size of boll, and that a high lint percentage is associated with relatively large bolls. The varieties of cotton which were the most profitable were characterized by high lint yields, medium to large-sized bolls, relatively high lint percentages, lint varying from $\frac{1}{8}$ to $1\frac{1}{8}$ in. in length, and relatively early maturity.

✓ **Svalöf Stjärn oats** [trans. title], Å. ÅKERMAN (*Sveriges Utsädesför. Tidskr. 37 (1927), No. 1, pp. 4–20, fig. 1*).—This new medium early variety of white oats of southern and middle Sweden was compared with a number of other important sorts. In 8 of 10 series of tests in six different localities Stjärn yielded on the average per test from 1.3 to 6.7 per cent more grain than was procured from Seger, the check variety, while in the other 2 series of experiments it stood 2.3 and 4.2 per cent below the check variety. In straw production it ranked below Seger in all tests, the average difference per test ranging from 0.5 to 7.4 per cent. In quality of grain the variety also compared favorably with the other sorts tested. The results of another series of local experiments indicated the

degree of adaptation of the Stjärn variety to certain sections of the country, as it gave much better yields in some sections than in others. In strength of straw Stjärn, compared at Svalöf with four leading varieties of white oats in four seasons from 1917 to 1926, inclusive, ranked first.

✓ Svalöf Orion oats II (01104) [trans. title], Å. ÅKERMAN (*Sveriges Utsädesför. Tidskr.*, 37 (1927), No. 4, pp. 199-209, figs. 3).—This new variety of black oats was compared for a number of years with other types of Orion oats in six different localities of sections of Sweden to which it is best adapted. The results of all tests showed an average increase of 5.6 and 4.5 per cent in the yield of grain and straw, respectively, over the yields of the check variety, Orion Ib. In a separate test at the Svalöf Experiment Station in progress from 1923 to 1926, inclusive, Orion Ib gave an average yield of 3,514 kg. of grain and 4,278 kg. of straw per hectare (3,127 and 3,807 lbs. per acre, respectively), while Orion II yielded 5 per cent more grain and 1.6 per cent more straw. The new variety frequently stood first and always ranked high in comparison with the other varieties tested in weight per hectoliter, weight per 1,000 kernels, and percentage of kernel content of the grain.

A systematic study of potatoes and the determination of varieties [trans. title], T. V. ASSEVA (*Moskov. Oblastn. Sel'sk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.]* 14 (1926), pp. 29, pl. 1, fig. 1).—Systems for the classification of potato varieties are discussed by the author, who presents a scheme resembling that of Bukasov (*E. S. R.*, 55, p. 336) and based on coloration of sprouts, tubers, and flowers, and degree of dissection of the leaf. Attempts were made to explain correlations between the colors of the tubers, sprouts, and flowers by the method of Salaman (*E. S. R.*, 24, p. 632). Tuber color has been used as the determining factor in the study, and sub-groups are formed on the color of eyes, spots on the tubers, and other characters.

Varieties of potatoes of the peasant plantings in the Government of Moscow [trans. title], T. V. ASSEVA (*Moskov. Oblastn. Sel'sk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.]* 15 (1926), pp. 62, figs. 45).—The potato varieties grown in the Government of Moscow have been described and classified according to the above classification.

Hand spraying and hand dusting potatoes, O. BUTLER (*New Hampshire Sta. Circ.* 26 (1927), pp. 16, figs. 6).—Comparative tests with potatoes during four years showed that the unit copper in Sanders' (copper-lime) dust was about half as effective as the unit copper in Bordeaux mixture. The experiments demonstrated that potatoes must be dusted weekly for results similar to those received from spraying with 8-4-50 Bordeaux mixture every 14 days. Dusting did not control early blight as satisfactorily as spraying with Bordeaux mixture and was greatly inferior in reducing injury due to tipburn. Late blight did not appear in the plats. Considering effectiveness of application, costs, and other factors, it appeared that spraying is to be preferred to dusting.

Report of progress in tobacco investigation, J. P. JONES (*Massachusetts Sta. Circ.* 74 (1927), pp. 8).—Inquiry into the causes of declining yields and quality of Havana seed tobacco was concerned with continuous culture v. rotation and the root rot situation (*E. S. R.*, 55, p. 450).

Results during the period 1924-1926 demonstrated that tobacco grown in continuous culture has been better in yield and quality than that in any of the other cropping systems tested. Addition of manure to the regular fertilizer seemed to cause improvement. Larger returns were obtained from tobacco grown continuously without a cover crop than when a timothy cover crop

(E. S. R., 54, p. 832) was employed. While tobacco in the 3-year money crop rotation (potatoes, onion, tobacco, fertilized with materials known to be favorable to good quality in tobacco) was not quite as good as that in continuous culture without a cover crop, it surpassed by a considerable margin tobacco produced in the animal husbandry rotation (corn, timothy, tobacco, fertilized the same as the other rotation but supplemented by the amount of manure which would be produced by feeding the corn and hay).

✓ **Studies in natural hybridization of wheat**, C. E. LEIGHTY and J. W. TAYLOR (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 10, pp. 865-887).—Observations and experiments on natural crossing in wheat were made at Arlington, Va., during the period 1917-1926. The segregation indicated that natural crossing was frequent in 1917, 1920, and 1924.

Varietal differences were noted ranging from a small amount of natural crossing in some sorts up to about 34 per cent in a strain of Fulcaster in 1917. Such differences are believed to be due often to environment. Extensive natural hybridization took place both in dry and wet blooming periods. In 1924 about six times as much natural crossing took place in the secondary heads of five common wheat varieties as in the primary heads. While two spelts in a special seeding in 1924 were almost entirely self-fertilized, they were the pollen parents in 58 natural hybrids with common wheat.

The significance of natural hybridization in varietal trials and in genetic investigations with wheat is commented on.

The resistance of certain varieties of winter wheat to artificially produced low temperatures, D. D. HILL and S. C. SALMON (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 10, pp. 933-937).—The merits of artificially freezing plants as a means of testing their relative hardiness was studied at the Kansas Experiment Station with ten wheat varieties. Greenhouse-grown plants were subjected to various low temperatures for different periods, with and without previous hardening, and with different percentages of soil moisture.

, Excepting two very hardy varieties, Minhardi and Minturki, the test results agreed closely with those in the uniform winter hardiness nurseries of the U. S. Department of Agriculture (E. S. R., 55, p. 35). Hardening seemed to be very important in determining survival, different varieties reacting very differently in this respect. Hardy varieties appeared to best advantage in those cases where hardening was the more nearly complete. The varieties were tentatively grouped into those which are relatively hardy when thoroughly hardened before freezing, including Minhardi, Minturki, and Buffum; varieties which are relatively hardy when hardened before freezing but which also carry a relatively high degree of hardiness in the unhardened condition, e. g., Kanred, Kharkof, and possibly Harvest Queen; and varieties which are relatively non-hardy regardless of whether they are hardened prior to freezing, including Blackhull, Nebraska No. 28, Fulcaster, and probably Tenmarq. Results of studies on the soil moisture factor confirmed the general observation that winter-killing is frequently more severe in dry soils than in those well supplied with moisture, excepting those cases where winterkilling is a result of heaving or smothering rather than of low temperature.

Commercial agricultural seeds, 1927, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp.* 126 (1927), pp. 61-83).—The purity, germination, and weed seed content are tabulated for 283 official samples of agricultural seed collected from dealers in Maine during 1927.

Results of seed tests for 1927, M. G. EASTMAN (*New Hampshire Sta. Bul.* 229 (1927), pp. 19).—The purity and germination percentages are tabulated for 398 official samples of agricultural seed collected in New Hampshire and tested during the year ended June 30, 1927.

The Bates laboratory aspirator, E. N. BATES and G. P. BODNAR (*U. S. Dept. Agr. Circ. 9* (1927), pp. 12, figs. 8).—The Bates laboratory aspirator, a device designed for separating granular materials by means of a current of air which passes through the substances as they fall in a thin stream, was developed primarily for use in connection with the laboratory analysis of rice and other grain and flaxseed and similar substances. Its construction, operation, and application are described briefly. A different form of the aspirator for use as an attachment to a threshing separator for cleaning grain, rice, and other seeds at the time of and as a part of the threshing operation has been described elsewhere (*E. S. R.*, 55, p. 279).

HORTICULTURE

[Horticultural investigations at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 8* (1927), pp. 34-41, 44-52).—This report as usual (*E. S. R.*, 56, p. 531) contains the results of variety tests with tomatoes, watermelons, beans, peas, peppers, peaches, strawberries, grapes, and dewberries, and fertilizer tests with tomatoes.

Peach trees grafted on plum roots with the idea of avoiding nematode injury succumbed shortly after blooming or during the succeeding summer. Upon examination it was found that the peach scions had grown more rapidly than the plum roots, with the apparent result that the cambium layers were forced apart, resulting in the death of the trees.

[Horticulture at the South Dakota Station] (*South Dakota Sta. Rpt. 1927*, pp. 23-27).—Plant breeding continued to be the major activity (*E. S. R.*, 56, p. 641), and brief descriptions are given of various seedling apples, pears, and roses which combine hardiness with utility.

Nutritional factors in seed and fruit formation in vegetable crop plants, P. WORK (*Mem. Hort. Soc. New York, 3* (1927), pp. 267-271).—A discussion, with special reference to the tomato, of the bearing of internal nutrition relationships upon fruitfulness. It is pointed out that the ratio between carbohydrate and nitrogen contents may vary considerably without affecting the plant's response, and that the available amount of the single factor that is in minimo is of greatest importance. The rate of manufacture as well as the content of carbohydrates needs consideration, and there is a need of determining more closely the functions of the various forms of nitrogen upon plant metabolism.

The long-row farm garden from planting to storage (*Illinois Sta. Circ. 325* (1928), pp. 20, figs. 5).—A presentation of general information, superseding Circulars 231, Storage of Vegetables for Winter Use (*E. S. R.*, 40, p. 44) and 278, A Plan for the Farm Garden (*E. S. R.*, 51, p. 39).

Commercial vegetable culture, H. KRATZ (*Der Erwerbsgemüsebau. Stuttgart: Eugen Ulmer, 1927*, pp. VIII+186, figs. 25).—A general treatise, with particular reference to the forcing of vegetables.

Insecticides and fungicides, 1927, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp. 126* (1927), p. 84).—Herein are presented, in conformity with the usual practice (*E. S. R.*, 56, p. 534), the results of the analyses of samples of insecticides and fungicides received from the commissioner of agriculture in 1927.

Analyses of materials sold as insecticides and fungicides during 1927, C. S. CATHCART and R. L. WILLIS (*New Jersey Sta. Bul. 459* (1927), pp. 16).—The customary report (*E. S. R.*, 56, p. 534) upon the results of analyses of insecticidal and fungicidal materials collected during 1927.

The power of leaves to withdraw moisture from the fruit and the consequent effects, F. J. DE VILLIERS (*So. African Jour. Sci.*, 24 (1927), pp. 318, 319).—Studies with excised apple twigs carrying leaves and fruit showed the leaves to be the most potent competitor for available water, drawing on

both the fruits and the twigs. Upon removal of the leaves the twig at first drew on the fruits, but as the osmotic concentration in the pulp cells of the fruit became increased the movement was reversed. The same dominance of leaves over fruits was noted in the grape, with a marked decrease as maturity approached and osmotic concentration increased. Negative turgidity may possibly cause undersized fruits and slender, abnormal twig growth.

Sterility in fruits, F. J. CHITTENDEN (*Mem. Hort. Soc. New York*, 3 (1927), pp. 79-85).—A summary of 20 years' studies with apples and pears at the Royal Horticultural Society's Gardens, Wisley, England.

Attention is directed to the effect of seasonal variations on pollination; for example, in one season only about 2 per cent of Cox Orange crosses yielded fruits, while in other years the average set of the same crosses ranged above 34 per cent. No approach to unisexuality was observed in cultivated varieties of apples. Partial self-sterility was frequent, but only one variety, Royal Jubilee, failed to set fruit with its own pollen. Cox Orange was found to be almost self-sterile. Despite variation in the percentage of fruit set, no evidence was found of cross-sterility in the apple or pear, leading the author to suggest that any two varieties of European pears or apples whose times of flowering overlap are suitable for intercrossing. Because of the reduction in yield usually following self-fertilization, cross-pollination in commercial plantings is considered to be imperative. Xenia, as manifested in differences of shape of fruits from selfed and crossed blossoms, was noted in pears.

Pollen production and incompatibilities in apples and pears, R. FLORIN (*Mem. Hort. Soc. New York*, 3 (1927), pp. 87-118, pls. 3).—A comprehensive discussion of sterility in the apple and pear, with particular reference to Swedish investigations, some of the results of which have been previously noted (E. S. R., 46, p. 39). The primary cause of low germination of pollen in certain pear varieties is deemed to be largely an irregular chromosome distribution during meiosis. A high degree of pollen viability, on the other hand, is associated with regular meiosis. No verified case of complete intersterility was observed in the pear.

Observations on Gravenstein apple pollen found low in viability (7.3 ± 1.3 per cent) showed a high percentage of abortive grains. An abnormal number of microspores frequently found in the tetrads formed during the division of the pollen mother cells suggests irregular chromosome distribution during meiosis similar to that recorded in the Winesap apple by Shoemaker (E. S. R., 54, p. 629). Degeneration of the anther loculi and degeneration in the microspores following liberation was observed in the Gravenstein.

Crossing studies showed intersterility to be rare in the apple, but demonstrated the value of cross-pollination as a practical measure in increasing yields. The occurrence and relative importance of three types of sterility, namely, impotence, incompatibility, and embryo abortion, are discussed.

Studies in relation to sterility in plums, cherries, apples, and raspberries, M. B. CRANE (*Mem. Hort. Soc. New York*, 3 (1927), pp. 119-134, pls. 5, figs. 3).—Sterility tests at the John Innes Horticultural Institution, England, with 33 varieties of sweet cherries showed all to be practically self-sterile, only 23 mature fruits being secured from a total of over 25,000 blossoms. Cross or intersterility was manifested in certain combinations and was always reciprocal. Abortive pollen occurred in various degrees but not sufficiently to interfere with pollination. Various degrees of self-sterility were observed in the sour and the Duke cherries. In crossing sweet and sour cherries, sweet cherries were most successfully utilized as ovule parents.

Studies with plums showed complete interfertility between the domestica and damson varieties. Pollinated with *Prunus spinosa*, domestica varieties yielded no seed; while with *P. cerasifera* occasional fruits were formed with usually imperfect seeds. Records taken on 47 varieties of plums showed 22, 8, and 17 to be self-sterile, partly self-sterile, and self-fertile, respectively.

Of 37 apples, 3 were self-sterile, 22 partially self-fertile, and 12 self-fertile, and no clear case of cross-sterility was found. Grimes was one of the 3 self-sterile varieties.

Chromosome determinations made by C. D. Darlington on various plums and cherries are recorded and their significance discussed. All sweet cherries examined had extra chromosomes beyond the diploid number, suggesting that hybridization with a tetraploid had contributed to their origin. It is suggested that a bispecific origin is involved in the different forms of sterility occurring in the cherry.

Histological studies carried on by the author and E. J. Collins showed that in both self- and cross-sterility pollen tubes were arrested in the stylar tissue, the ends swelling up with a slime sheath forming over them. Self-pollination of the Superlative and Norwich Wonder raspberries yielded a number of seedlings with impotent pistils. These male plants bore obtuse, downfolded, and undivided leaves on the fruiting canes and 3-lobed, short-petioled leaves on the young canes. No such offtypes were found in the progeny of these varieties resulting from cross-pollinations.

Arsenic in New-Zealand-grown apples, R. L. ANDREW (*New Zeal. Jour. Sci. and Technol.*, 9 (1927), No. 4, pp. 206-209).—Studies with apples which had been sprayed according to the general orchard practice in New Zealand showed only two instances where fruits exceeded the generally accepted tolerance of 1/100 grain of arsenic to the pound of fruit. In these two cases the trees had been sprayed within 1 day and 2 hours before harvesting, respectively. A lapse of from 12 to 15 days between final spraying and time of picking apparently insured safety. The highest amount of arsenic found in peeled fruits was 1/700 grain to the pound. Wiping with dry cloths failed to reduce the arsenic residue to a safe amount.

Soil treatments and seasonal changes in the sour cherry, A. G. ANDERSON and H. D. HOOKER (*Missouri Sta. Research Bul.* 108 (1927), pp. 27, figs. 17).—Spurs and shoots collected at monthly intervals for about one year from three plats of sour cherry trees were analyzed for moisture, total and water-soluble nitrogen, sugars, and starch. One plat was tilled, one was in sod, and the third plat, also in sod, received annual spring applications of nitrate of soda. The analyses revealed a conversion of starch to sugar during the winter and a resynthesis of starch in March. Translocation of nitrogen was shown by a marked increase in the percentages of nitrogen in spurs and shoots at the beginning of active spring growth. In addition to maxima in March and September, the carbohydrate curves showed a third maximum at the end of May followed by a minimum a month later. Maximum fruit bud formation was associated with maximum carbohydrate accumulation at the end of June.

A pistillate *Prunus*, C. O. SMITH (*Jour. Heredity*, 18 (1927), No. 12, pp. 537-541, figs. 4).—A record is given of the unusual flower characters in certain seedlings of *P. umbellata*. Petals were much reduced in size, giving the flowers an apetalous appearance. Stamens were altogether absent, being replaced with from 10 to 20 tomentose pistils occupying the normal position of the stamens and having no connection with the ovary. Pollination gave negative results, suggesting probable sterility.

Roxburgh's giant fig in Teneriffe, D. FAIRCHILD (*Jour. Heredity*, 18 (1927), No. 12, pp. 533-536, figs. 3).—*Ficus roxburghii* is described as a curious species bearing clusters of extra large figs, not only on the branches but also upon the trunk and about the root crown. Without irritation either from the visit of insects or from artificial manipulation the fruits remained woody and inedible.

The nature of the grape flowers [trans. title], M. TUPIKOV (*Trudy Ak-Kavak. Opytn. Orositel. Sta. (Trans. Irrig. Expt. Sta. Ak-Kavak)*, No. 4 (1927), pp. 95-118, pl. 1, figs. 8; *Eng. abs.*, pp. 117, 118).—A wide range in floral types was noted in cultivated grapes in the vineyards of the Ak-Kavak Experiment Station, Russian Turkestan. Frequently different types of flowers were observed on a single cluster, leading the author to suggest the unreliability of former classifications based on the relative development of the pistils and stamens.

The true female flower of grape [trans. title], P. BABANOV (*Trudy Ak-Kavak. Opytn. Orositel. Sta. (Trans. Irrig. Expt. Sta. Ak-Kavak)*, No. 4 (1927), pp. 119-137, pls. 2, figs. 11; *Eng. abs.*, pp. 136, 137).—All of the flowers on nine vines of the Mourvèdre grape growing in the vineyard of the Ak-Kavak Experiment Station, Russian Turkestan, were found to be completely free during all stages of development of any vestiges of stamens, thus presenting a morphologically perfect female to add to the already recognized types of grape flowers, namely, hermaphrodite, male with rudimentary pistil, and female with rudimentary stamens. The off-type Mourvèdre vines yielded a full crop upon cross-pollination.

Cleistogamy of Central Asiatic varieties of grape [trans. title], P. BABANOV and M. IVANOVA-PAROLSKAIA (*Trudy Ak-Kavak. Opytn. Orositel. Sta. (Trans. Irrig. Expt. Sta. Ak-Kavak)*, No. 4 (1927), pp. 79-94, figs. 13; *Eng. abs.*, pp. 93, 94).—Cleistogamy was observed in three varieties of grapes, Black Kishmish, White Kishmish, and Bouaki, growing at the Ak-Kavak Experiment Station, Russian Turkestan. Cleistogamy was constant in the Bouaki variety, being caused in the authors' opinion by the shortness of the filaments which prevented the stamens from pushing off the cap or calyptra. In the Kishmish varieties various outside factors, such as moisture and light variations, apparently contributed to the nonremoval of the caps. Berries resulting from self-pollination were quite normal and similar to those from cross-pollination.

Sterility in certain grapes, T. SUSA (*Mem. Hort. Soc. New York*, 3 (1927), pp. 223-228, pl. 1, fig. 1).—Of 17 varieties of grapes, 8 with semireflexed and 9 with fully reflexed stamens examined at the Hokkaido Imperial University, Japan, none yielded viable pollen. However, with the Madelaine Angevine variety, the pollen of which was nonviable in artificial media, some seed was obtained in bagged clusters in the greenhouse. Precocoe de Malingre proved the best pollinizer for Madelaine Angevine.

Pollen germination tests in Japan with the White Corinth, Sultana, and Sultanina seedless varieties whose flowers resembled those of perfect hermaphrodites showed strong viability. Similar studies conducted at the University of California with Black Monukka, Black Corinth, White Corinth, Sultana, Sultanina, and other varieties showed strong viability and good growth in every case. White Corinth, Sultanina, and Sultana proved as fruitful when selfed as when cross-pollinated. Emasculated and protected clusters of White Corinth set fruit satisfactorily, indicating parthenocarpic production. In similar tests with Black Monukka and Sultanina only small sized berries developed. Various grades of seedlessness observed in seedless grapes are believed to be due to the degree of abortiveness in the embryo rather than to imperfect fertilization, since pollen was vigorous and abundant.

Observations on the Japanese wild grape, *Vitis coignetiae*, showed two floral types, one with abortive or rudimentary pistils and viable pollen and the other with normal pistils and aborted pollen. Studies on the longevity of grape pollen showed in one instance (Allcante) 4 per cent germination 1 year after collection.

Wild grape in Central Asia.—I, Western Tien Shan [trans. title], P. BARANOV (*Trudy Ak-Kavak. Opytn. Orositel. Sta. (Trans. Irrig. Expt. Sta. Ak-Kavak)*, No. 4 (1927), pp. 1-78, pls. 3, figs. 2; *Eng. abs.*, pp. 75-78).—Observations upon wild grapes growing in the vicinity of Tashkent, Russian Turkestan, revealed two floral types, hermaphrodite and female. No male types were found. Fruit color was highly variable, pink, green, and black in various shades. The flavor was sweet in every instance. The heterozygosity of types, similarity of flower types with cultivated varieties, the high sugar content, and the large percentage of sterile pollen in hermaphrodites leads the author to the belief that the so-called wild grapes of this region are escapes from cultivation.

Pecan growing in Florida. G. H. BLACKMON (*Florida Sta. Bul. 191 (1927)*, pp. 81-143, figs. 46).—General information is presented upon the history and development of the pecan-growing industry in Florida, with supplementary information on the botanical characters, on methods of propagation, culture, varieties, harvesting, marketing, etc. Observations on the growth of seedlings resulting from pecan nuts of various sizes and obtained from various sources showed that small to medium sized nuts ranging from 75 to 90 per pound produced the largest seedlings. Seedlings from scab-susceptible parents were apparently susceptible to this disease and are therefore not recommended for propagation.

Forcing asters with lights. A. LAURIE (*Amer. Florist*, 70 (1928), No. 2070, pp. 7, 8, figs. 2).—Aster plants set out in the greenhouse in February and given in addition to the normal day 3 supplemental hours of light exposure from 1,000-watt lamps averaged 20 blooms with stems 18 to 24 in. long, while control plants yielded fewer flowers and shorter stems. Another lot benched September 20 bloomed in 86 days with supplemental light as compared with 100 days for normal light. The treated plants averaged 12 blooms with 9-in. stems as compared with 5 blooms and 3-in. stems for the controls. Longer exposures than 3 hours were not more successful.

The book of the chrysanthemum, edited by O. HEYNECK (*Das Buch vom Chrysanthemum. Frankfurt on the Oder: Trowitzsch & Son, 1927*, 2. ed., pp. [3]+95, pl. 1, figs. 34).—A general discussion upon origin and development in Japan, introduction to European countries, outdoor and indoor culture, control of pests, etc.

Sterilities encountered in the breeding of peonies. A. P. SAUNDERS (*Mem. Hort. Soc. New York*, 3 (1927), pp. 45-49).—A record of observations upon self- and cross-sterilities in the peony made during the course of 10 years' investigations, in which numerous species were studied and used.

Sterility encountered in rose breeding. J. H. NICOLAS (*Mem. Hort. Soc. New York*, 3 (1927), pp. 55-57).—A brief article pointing out the frequent occurrence of sterility in cultivated roses and discussing the underlying causes, chief among which is hybridity. The author found that the more extreme color combinations were less fertile, that in many instances grafted plants were more fertile than own rooted plants, and that the character of the soil had an influence. Pollen kept in manilla envelopes retained its viability for over two months.

Hardy roses: Their culture in Canada. W. T. MACCOUN and I. PRESTON (*Canada Dept. Agr. Bul. 17, n. ser., rev. ed. (1927)*, pp. 40, figs. 17).—General information is offered on varieties, cultural requirements, pruning, and winter

protection, supplemented with notes on rose breeding activities at the Central Experimental Farm, Ottawa. Chapters on insect pests of the rose and their control and on the diseases of roses and their control are contributed by the entomological branch and the division of botany, respectively.

FORESTRY

Studies in tolerance of New England forest trees.—VII, Leaf efficiency in thrifty and stunted white pine seedlings, G. P. BURNS (*Vermont Sta. Bul.* 267 (1927), pp. 27, pl. 1, figs. 14).—A further contribution to this general series (*E. S. R.*, 57, p. 242).

The conclusion is reached that unevenness in the growth of seedling conifers in the nursery bed is due largely to variations in the supply of soil moisture rather than in light factors. Trees at the margin of the beds were observed to be distinctly larger with foliage of darker green and with more abundant and branching roots. In unwatered white pine beds subdivided into six parts covered with from one to six layers of cheesecloth, respectively, there was found a definite gradation in size from a minimum under six layers to a maximum under one layer. The needles showed a gradual increase in length from 23 to 87 mm.

Under similar shade treatment but with water supplied there was recorded no such gradation, the plants in all six subdivisions appearing quite alike. The needles were longest in the one and two cover plats and shortest in the open sunlight. The most conspicuous decrease in growth resulting from shading was in the diameter of the leaders and the secondary growth of the hypocotyl.

A comparison between comparable plats in the nonwatered and watered series showed beyond question that lack of moisture was the outstanding cause of stunted growth. Using as an index to leaf efficiency the dividend obtained by dividing the total volume of wood produced by the dry weight of the needles, it was evident that small leaves of stunted trees produced approximately as much wood per unit weight as did leaves of large, vigorous trees, thus suggesting that light variations were not an important factor.

Observations on the subsequent recovery of stunted trees when transplanted to a favorable environment showed rapid recovery in all three species, white pine, Scotch pine, and Norway spruce. Within 2 or 3 years the stunted trees were making equal annual height growth to the nonstunted individuals. The stunted trees remained, however, relatively smaller, indicating the advisability of growing trees under favorable nursery conditions.

Forest planting experiments in Minnesota, T. S. HANSEN (*Minnesota Sta. Bul.* 238 (1927), pp. 32, figs. 22).—This includes and continues some work previously noted (*E. S. R.*, 38, p. 845).

For planting trees on unbroken soil a heart-shaped spade was found the most satisfactory tool. Direct seeding was almost as costly as transplanting and was decidedly less successful. No constant relationship was found between survival and weather conditions at the time of planting, but the distribution of rainfall during the first growing season apparently had some effect. In 1914, a year presenting three critical drought periods, survival was 67 per cent as compared with 84 and 89 per cent in 1915 and 1916, years of one and no critical periods, respectively. No differences were determined between survival on two soil types, Omega sand and Cloquet sandy loam.

Of several exotic species, Scotch pine, western yellow pine, red spruce, Norway spruce, and blue spruce, used in planting tests, the Scotch pine alone proved at all successful. Studies of survival on four rather distinct sites, (1) cut-over barren, (2) sweet fern, (3) brushy area, and (4) mature jack pine,

showed that the various species have special requirements. The survival of all classes of white pine was best under the mature jack pine and poorest on the cut-over barren. Norway pine prospered best under the jack pine and poorest on the sweet fern site. Jack pine and Scotch pine, on the other hand, thrived best on the cut-over barren. The variation in survival between the different grades of planting stock was less notable in the jack pine than in the other species. The results with all four species were generally satisfactory on all sites and in all age classes, for in only three instances did survival fall below that required to secure an adequate stand.

Comparing fall and spring planting, it was found that on the sweet fern site fall planting was very satisfactory and in the case of white and Norway pines gave higher survival than did spring planting. With jack pine the results were about equal between seasons and with Scotch pine a little in favor of spring planting.

As an under planting for jack pine, Scotch pine grew most satisfactorily followed by white and Norway pines. Transplants showed higher survival and better subsequent growth than seedlings.

Forests and floods, W. SHEPARD (*U. S. Dept. Agr. Circ. 19* (1928), pp. 24, figs. 9).—Frankly admitting that forests are but one of the many influences affecting the flow of streams, the author discusses in detail the effect of forests on run-off and erosion, taking up such subjects as the forest as a soil and water holder, deforestation and erosion, effect of deforestation on large rivers, aspects of the problem in different sections of the Mississippi River watershed, and a suggested forestry program for this area. The well-kept forest is conceded to be an effective water and soil holder, the leaf litter and humus absorbing in the aggregate vast quantities of water. Forests also retard the melting of snow and delay and prevent run-off. As a protective measure for the Mississippi Valley it is urged that public forests and forest activities be greatly extended, especially in the mountainous and swampy areas.

DISEASES OF PLANTS

The fungous flora of Kansas, E. BARTHOLOMEW (*Kansas Sta. [Pub.], 1927*, pp. 46).—An alphabetical list is given of the names of all known and collected fungi indigenous to the State of Kansas. The catalogue is published for the purpose of indicating to mycologists just what fungus plants are found in the State.

The dependence of phanerogamic parasites on the nutrition of the host plants [trans. title], H. MELHARDT (*Bot. Arch., 13* (1926), No. 5-6, pp. 449-474, fig. 1).—Calcium as CaCO_3 showed no favorable influence on the growth of vetch or of its parasitic *Cuscuta*. Gypsum favored growth in both. Calcium in the ash of the plants was not proportional to that in the soil. The alleged observation by Laurent (*E. S. R., 13*, p. 144), regarding the limitation of the growth of *Cuscuta* by phosphate manuring, is said to have been repeated by the present author. It was possible to cause, by manuring, an alteration of the ash and calcium content, as well as of acid and alkali reserve and of growth rate. Content of reducing substance in clover plants was also influenced by calcium manuring.

In general, soil fertilization and plant composition showed a close connection throughout this work.

Inhibition of enzymatic action as a possible factor in the resistance of plants to disease, L. J. KLOTZ (*Science, 66* (1927), No. 1721, pp. 631, 632).—In an investigation on the resistance of the sour orange and susceptibility of lemon to gummosis due to *Pythiactis* and to decortiosis, it was found that

the trunk bark of sour orange had a greater inhibitory or paralyzing influence on the action of certain enzymes found in the dried mycelial powder of the causal fungi than did the trunk bark of lemon. This is said to suggest the possibility that resistance to the invasion of the pathogenes might be due to the inhibition of one or more of the enzymes of the fungi by some cellular product of the host.

Experiments are reported in which it was found that the hydrolytic action of the diastase and invertase in the dried mycelium of both *P. citrophthora* and *Phomopsis californica* was inhibited more by sour-orange bark than by lemon bark. Bark of tangelo, a hybrid of pummelo and tangerine, which had been found by inoculation tests to be very resistant to *Pythiacystis*, showed about the same degree of inhibition of fungus diastase and ptyalin as did the sour orange. The author states that so far as is known this inhibiting or paralyzing effect of the plant tissues themselves upon certain fungal enzymes has not been suggested or tested as a possible basis for disease resistance in plants.

The problem of dry disinfection and research method in dusting [trans. title], SCHANDER, STOLZE, and ROTHMALER (*Pflanzenbau [Berlin]*, 3 (1927), No. 16, pp. 241-260, figs. 10).—A study is presented of disinfectants offered and of methods, with tabulations and recommendations including several proprietary dust fungicides.

Pentathionic acid, the fungicidal factor of sulphur, H. C. YOUNG and R. WILLIAMS (*Science*, 67 (1928), No. 1723, pp. 19, 20).—In a previous publication by the first author (*E. S. R.*, 50, p. 345) it was shown that pentathionic acid is the fungicidal factor accompanying the use of sulfur.

Additional studies were made to ascertain the definite chemical relationship of the toxic factor of sulfur to sulfur itself and to determine the effect of certain factors influencing this relationship. From the results of their investigations the authors claim that pentathionic acid is the toxic factor of sulfur, and that this compound is quite sensitive to basic materials. The natural oxidation and dissolving of sulfur are said to give a continuous yield of pentathionic acid. Very finely divided sulfur oxidized more readily and consequently was more toxic. The results of these experiments are said to explain why failures occur with so many commercial dusts and sprays which have been made up more from the standpoint of spreading and sticking than maintaining toxicity. Basic compounds are said to aid in spreading and sticking, but they inhibit toxicity.

The phytopathological examination of seed [trans. title], M. KLEMM (*Pflanzenbau [Berlin]*, 2 (1926), No. 15, pp. 242, 243).—An attempt is made at standardization of examination and of practice as regards classification and treatments of seed grains in view of differences in degree of infection with disease organisms.

Low temperature testing of pickled cereal seed [trans. title], E. MOLZ and K. MÜLLER (*Pflanzenbau [Berlin]*, 2 (1925), No. 12, pp. 185-189).—Varieties vary among themselves and show differences at different times as regards the effects of steepings. Tabular showings are discussed.

The electric hot water seed grain steep [trans. title], E. TAMM and B. HUSFELD (*Pflanzenbau [Berlin]*, 2 (1926), Nos. 13, pp. 197-202; 14, pp. 213-220).—A detailed and tabular account is given of different phases of the preferred electrically controlled hot water treatment of cereal seeds.

Copper sulfate and copper-containing seed grain steepings [trans. title], H. HÜLSBERG (*Pflanzenbau [Berlin]*, 2 (1926), No. 14, pp. 224-227).—Comparative tests are displayed showing the relative effectiveness of standard and of proprietary seed-grain treatments.

The effects of different disinfectants [trans. title], K. WESTERMEIER (*Pflanzenbau [Berlin]*, 3 (1926), No. 7, pp. 109-112).—The effects, as regards afterinfection and seed injury, are shown for the seed treatments Agfa, Fusariol, Germisan, Hohenheimer Beize, Kalimat, Tillantin, Uspulun (dry and in spray), and Porzol (dry).

Testing grain treatments [trans. title], A. RÜSCH (*Pflanzenbau [Berlin]*, 3 (1926), No. 7, pp. 107-109).—A method, claimed to be new, expeditious, and effective, of testing the efficiency of grain disinfectants is briefly described.

Wet Treatment of cereal seed in dry treatment apparatus [trans. title], G. HOFFMANN (*Pflanzenbau [Berlin]*, 3 (1927), No. 20, pp. 318, 319).—A certain dry treatment apparatus is indicated as having proved adaptable in the working out of a plan to apply moist fungicides to cereal seed. Methods, costs, and results are referred to as encouraging.

Dehulling barley seed with sulphuric acid to induce infection with covered smut, F. N. BRIGGS (*Jour. Agr. Research [U. S.]*, 35 (1927), No. 10, pp. 907-914).—A description is given of a method of dehulling barley used in comparative studies at the California Experiment Station on the relative resistance of varieties of barley to covered smut, *Ustilago hordei*.

Treating hulled barley with sulfuric acid proved to be a satisfactory method for use in infecting barley with covered smut. Seed subjected to different treatments produced stands equal to those from hand-dehulled seed, and the resulting plants contained similar percentages of smut.

The experiments are said to indicate that it is not necessary to remove the barley hull completely in order to induce satisfactory infection with covered smut. The best stands, accompanied by satisfactory infection, were obtained when a thin hull remained over the entire kernel or at least over the germ end. The acid treatment described is believed to simplify the method of inducing covered smut in barley so that varieties may be tested in large numbers for resistance to the disease and the segregation of the resistant forms in hybrid generations determined.

Studies on *Ustilago avenae* and *U. perennans* [trans. title], A. ROESCH (*Bot. Arch.*, 13 (1926), No. 5-6, pp. 382-432, figs. 9).—A systematic account is given of oat loose smut (*U. avenae*) and a shorter outline of a smut of meadow oat grass (*Avena elatior*), with particular reference to the question of immunity of oats against oat loose smut (*U. avenae*).

Studies of the life history of *Ustilago avenae* (Pers.) Jensen and of *Ustilago levis* (Kell. & Swing.) Magn., G. R. GAGE (*New York Cornell Sta. Mem.* 109 (1927), pp. 35, pls. 4).—On account of the conflicting opinions relating to the life history of the loose and covered smuts of oats, and especially of the reported blossom infection claimed by Zade (*E. S. R.*, 56, p. 543), Arland (*E. S. R.*, 56, p. 448), and Roesch (noted above), the author made a study of *U. avenae* and *U. levis* on glumed and glumeless varieties of oats.

It was found that spores which reach the stigma of the oat flower at pollination time germinate at once or within a few days. This happened in glumed and glumeless varieties of oats, with both smuts. Spores lodging on the ovary walls also germinate in a very short time. With glumed oats the inoculation period was found to be rather short, being restricted to the time during which the glumes were open for pollination. With glumeless oats the inoculation period extended from pollination time until and during threshing. The success of inoculation depended to a large extent upon the time of spore dissemination and the length of the period required by the spores to reach the ovaries or the caryopses. Spores of *U. avenae* were found to be disseminated over a period extending from shortly before pollination to harvest, and spores of *U. levis* were not disseminated to any extent until the very last of the flowers were

being pollinated. With the glumed varieties the possibility of spores of *U. levis* entering open flowers is said to be much less than for *U. avenae* spores. With the glumeless varieties the majority of the spores of *U. levis* were found to reach the caryopses of the oats during threshing.

Mycellium resulting from the spores germinating at blossom time was able to penetrate the glumes, but this mycellium is considered insignificant or at least unnecessary as a source of inoculum for seedling invasion, and it was entirely wanting in the case of glumeless oats. Mycellium resulting from spore germination during the blossoming or the maturing period, or even when the oats are in storage, is said to penetrate and invade the pericarp of the caryopses and become established in and under the epidermal cells. It is claimed that the mycellium in the pericarp is accountable for most of the seedling invasion.

The success of invasion resulting in spore formation is considered to be dependent upon certain combinations of environmental factors, rather than on any specific one. In general, slow germination of the oat and continued slow development of the plant favored the pathogens.

The influence of hot water on the spores of *Ustilago avenae* [trans. title], I. V. NOVOPOKROVSKIĬ (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad])*, 4 (1926), No. 1-2, p. 85).—A résumé of a paper presented before the Russian Botanical Society, in which the author has checked up anew the effectiveness of hot water in killing the spores of *U. avenae*. After exposure at 60° C. (140° F.) for 5 minutes the spores failed to germinate, and the same effect was produced by exposure at 55° for 20 minutes.

[Wheat rust and weather], BUCHOLSKI (*Pflanzenbau [Berlin]*, 3 (1926), No. 7, pp. 106, 107).—Weather and observational data are given for the winter of 1924-25 in connection with the incidence of yellow rust on varieties of winter wheat and with the results of these conditions.

Bread or barberries, E. M. PATCH (*U. S. Dept. Agr., Misc. Pub. 7* (1928), pp. II+14, figs. 9).—The relation of the common barberry to wheat stem rust is pointed out, and a plea is made for the destruction of barberry plants to prevent epidemics of rust.

Treatment of cereal seed against smuts [trans. title], L. GARBOWSKI and P. LESZCZENKO (*Rocz. Nauk Rolnicz. i Leśnych*, 14 (1925), No. 1, pp. 44-56; *Fr. abs.*, p. 56).—Among the more efficient wheat seed treatments tried against *Tilletia tritici* were 0.1 per cent formaldehyde for from 10 to 30 minutes or Germisan at 0.125 per cent during 1 hour. Copper carbonate, used against *T. tritici*, also notably decreased the incidence of the disease.

Seed wheat dry treatments [trans. title], MÜLLER-WIENER (*Pflanzenbau [Berlin]*, 3 (1926), No. 10, pp. 152-154).—Tests are indicated as made on wheat stinking smut and oat loose smut with the dry disinfectants Höchst, Abavit, Tutan, No. 998, No. 225, and Uspulun.

The energizing influence of stinking smut treatments on germination and early growth stages [trans. title], U. SENF (*Bot. Arch.*, 10 (1925), No. 3-4, pp. 209-290).—The stimulating influence on wheat seed is discussed as found of copper sulfate, formaldehyde, Corbin, Uspulun, Fusafine, Weizenfusariol, Germisan, Segetan, and Tillantin B. Orientation studies with other substances or means are briefly noted.

1927 experiments on brown-patch control, J. MONTEITH, JR. (*Bul. U. S. Golf Assoc. Green Sect.*, 7 (1927), No. 11, pp. 210-216, figs. 2).—The results herein indicated, chiefly those which were obtained in experimentation for control of small brown patch, repeatedly confirmed those previously reported. With the exception of mercuric sulfide, all the fungicides tested controlled the disease, including mercuric oxide, calomel, mercuric cyanide, corrosive sublimate, mer-

curous nitrate, mercuric sulfate, Semesan, and Uspulun. Some particulars are indicated for calomel, which regularly protected the turf longer than any other chemical containing an equal amount of mercury. Burning due to calomel did not show as quickly as did that due to the other mercury compounds, and this compound when used in the recommended quantity gave only a temporary though a quite objectionable yellowing. In the more finely ground grades, calomel becomes more readily available, burns more quickly, and becomes sooner nonprotective. Admixtures of other mercury compounds gave encouraging results.

Seed treatment for corn diseases, I. E. MELHUS, C. S. REDDY, W. P. RALEIGH, and L. C. BURNETT (*Iowa Sta. Circ. 108* (1928), pp. 16, figs. 11).—The authors describe the dry-rots of corn caused by *Diplodia*, *Basisporium*, and *Gibberella*, and give the results of experiments for the control of these fungi by seed treatments. Liquid treatments proved of little practical benefit, and some of the treatments injured the germination of the corn. A number of dust fungicides were tested, and three mercury preparations gave satisfactory control and increased yields by from 2.5 to 5 bu. per acre, at an additional cost of 3 or 4 cts. per acre for the material used.

In connection with the experiments it was found that the dusts affected the rate of dropping of the seed corn, and that talc and lime, common fillers, reduced the stand by about 1 per cent for talc and 7 per cent for lime. Adjustments of the machine should be made, or the benefits of treatment may be lost through reduced stands.

Corn ear rot (*South Dakota Sta. Rpt. 1927*, p. 4).—In continuation of investigations on corn ear rot (E. S. R., 56, p. 649), studies of numerous selfed strains of corn revealed a number of forms, among which were tipburned leaves, crinkled leaves, rolled tops, chlorophyll deficient, and narrow leaved types. Some of these appeared to be caused by definite organisms, and attempts were being made to reproduce them by inoculating supposedly normal plants. Inoculations are said to have indicated that it is possible to induce by such means characters that are commonly called disease characters, but which seem to be heritable.

[A little-known form of clubroot], H. PAPE (*Pflanzenbau* [Berlin], 2 (1925), No. 11, pp. 172, 173, figs. 2).—A form of cruciferous clubroot or finger-and-toe is described, as unusual, with notes regarding the size of the spores of the organism, *Plasmiodiophora brassicae*.

Potato experiments (*South Dakota Sta. Rpt. 1927*, p. 7).—A brief account is given of studies in which various mercury compounds, copper compounds, anaesthetics, and formaldehyde were employed in treating seed potatoes that were cut before planting. It was observed that overtreating seed potatoes with anaesthetics in an attempt to break the rest period destroyed the germination. It was also found from seed treatments used at early and late dates before planting that corrosive sublimate may be utilized for seed treatment some days or weeks before planting, with no injury resulting and possibly with some beneficial effect.

Wound periderm formation in the potato as affected by temperature and humidity, E. ABTSCHWAGER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 11, pp. 995-1000, figs. 4).—A report is given of the effect of temperature and humidity on the suberization processes in the potato. It is claimed that since suberization or an equivalent blocking-off process is prerequisite to wound periderm formation the factors governing the rate of suberization will also affect the second process.

No periderm cells were observed at a temperature lower than 7° C. (44.6° F.) in the experiment reported upon. At 7° the first periderm cells appeared in

the variety Irish Cobbler after the ninth day, whereas in the Russet Rural and other varieties examined no cork cells appeared, even on the tenth day. At 10° the first periderm cells appeared in Irish Cobbler after the fourth day, and in other varieties after the sixth. At 15° periderm cells were observed after the third day, and at 21° and above after the second day, regardless of the variety. It is claimed that, once initiated, periderm formation proceeds rapidly at the higher temperatures, so that after the third or fourth day there are usually present several rows of new cells.

Relative humidity was found to play an important part in suberization and periderm development. In several varieties of potatoes kept at 12° for 6 days at 64 per cent humidity only the initial stages of suberization became evident; at 74 per cent humidity one or one and one-half layers were suberized; and at 94 per cent humidity up to two layers were well suberized.

At lower storage temperatures the effects were similar. At 6.5° and 70 per cent humidity suberization was marked after a period of 53 days, but no periderm developed. At 95 per cent humidity, however, a well-developed periderm was noticeable.

The type of injury was found to have an effect on the development of wound periderm. The reaction to cuts and stabs was as described above. When young tubers were injured by blows, the young periderm cells were commonly crushed, while the older periderm showed little effect. An irregular development of periderm occurred below the margin of injury or wherever there was an actual break in the original periderm, but there was only slight or no development beneath the tissues which were merely crushed. Tubers injured by peeling off the skin responded readily with the development of an extensive periderm. When the peel was removed smoothly the new periderm cells developed within one cell layer of the surface, whereas if the surface was much abraded a deeper-seated periderm resulted.

Rhizoctonia disease (hypochnose) of potato and its control [trans. title], K. O. MÜLLER (*Pflanzenbau [Berlin]*, 1 (1925), No. 21, pp. 358-361).—Largely a review, with recommendations.

Potato Golden Wonder and virus diseases, W. M. FINDLAY (*Gard. Chron.*, 3. ser., 77 (1925), No. 1992, p. 154).—A stock of Golden Wonder potato, selected for apparent freedom from mosaic and planted during 1921-1924, showed at the end decided superiority as regards yields over the mosaic control, though an occasional selected plant showed mosaic. Mosaic is said to be, as yet, practically nonexistent in the north of Scotland, where also during most years very few aphids are found.

Pests and diseases of sugar beet in Poland [trans. title], A. KRASUCKI (*Rocz. Nauk Rolnicz. i Leśnych*, 15 (1926), No. 2, pp. 389-406).—Lists, with a bibliography, are given of plant pests and diseases in Poland during 1921-1925.

The root disease complex of sugar cane, H. P. AGEE ET AL. (*Assoc. Hawaii. Sugar Technol. Rpts.*, 5 (1926), pp. 5-43, figs. 14).—An introductory account by H. P. Agee (pp. 5-7), dealing briefly with the history of what has been called Lahaina disease, or growth failure complex, in Lahaina (Otaheite, Bourbon, or Louzler) cane, and including mention of historic epidemics, said to have occurred as far back as 1848, in which Lahaina cane figured, is followed by Excerpts from Letters pertaining to the Failure of Lahaina Cane in the Hilo District, from J. T. Moir (pp. 8-10); The Possible Relation Between Nematode Injury to Cane Roots and Soil Conditions, by G. R. Stewart (pp. 10-13); Nematodes Considered in Relation to Root Rot of Sugar Cane in Hawaii, by F. Muir (pp. 14-18); Injury to Cane Roots in Hawaii by Soil Animals Other Than Nematodes, by R. H. Van Zwaluwenburg (pp. 18-25); Fungous Root Rots

in Relation to Lahaina Growth Failure, by H. A. Lee, D. M. Weller, and C. C. Barnum (pp. 25-31); Growth Failure on Soils Irrigated with Artesian Water (pp. 31-34) and Growth Failure on the Acid Soils (pp. 34-38), both by W. T. McGeorge; Root Disease of Sugar Cane in Louisiana, by R. D. Rands (pp. 38, 39) (E. S. R., 55, p. 148); and The Sugar Cane Disease Situation in 1923-1924 (in Louisiana), by C. W. Edgerton, W. G. Taggart, and E. C. Tims (pp. 40-43) (E. S. R., 52, p. 548).

Eye spot disease, H. A. LEE (*Assoc. Hawaii. Sugar Technol. Rpts.*, 5 (1926), pp. 43-51, pl. 1, figs. 3).—Sugar cane eye spot has been reported from India, Cuba, Santo Domingo, Barbados, Trinidad, Porto Rico, the Philippines, Formosa, Java, Réunion, Jamaica, and the Hawaiian Islands, but is of minor importance in most countries, probably due to the use of resistant varieties. It is compared with other cane diseases for purposes of field recognition. Eye spot is caused by *Helminthosporium* (*Cercospora*) *sacchari*. Moisture on cane leaves is favorable to the disease, as is also succulent leaf growth. Heavy soils are more favorable than loose soils to eye spot, and the disease often follows insect attacks. The principal injury results from the top rot. Sulfur dust lessened eye spot, but resistant varieties are the only known forms of natural control. Areas heavily infected have been burned off, lessening the spread of the disease without injury to the cane, which renewed growth with only negligible loss.

Resistance of young potted sugar cane seedlings to eye spot disease, J. P. MARTIN and N. S. DEVERILL (*Assoc. Hawaii. Sugar Technol. Rpts.*, 5 (1926), pp. 51-53).—It appears from tests outlined and tabulated that the resistance or susceptibility of young potted cane seedlings to the eye spot disease may be determined at the age of three or four months instead of waiting a year or more for the final field results. Since only seedlings showing a high degree of resistance to eye spot would be planted in the field, the total number would be reduced from 40 to 60 per cent. The advantages of this reduction are pointed out.

Relation of the adjustment of soil reaction to black root-rot of tobacco, W. L. DORAN (*Science*, 66 (1927), No. 1722, pp. 661, 662).—In a previous publication by Anderson, Osmun, and Doran (E. S. R., 55, p. 450), it was shown that a soil made less acid by the use of lime is more favorable to the development of black root rot of tobacco, caused by *Thielavia basicola*, and that practically no loss occurred in a soil more acid than pH 5.6. There were severe losses in soils less acid than pH 5.9.

The results are given of experiments by the author on the relation of acidifying chemicals to the H-ion concentration of the soil and to the control of black root rot. Acids were applied to soil of known pH value infested with the fungus, and in such soil tobacco was grown. In field experiments in which various quantities of sulfur were added to the soil, it was found that the yield of tobacco was increased in proportion to the amount of sulfur employed. In pot experiments, the increases in soil acidity by the application of nitric acid and sulfuric acid were equally efficient in preventing severe black root rot. The only organic acid used which protected tobacco against infection was acetic acid. The plants were free from black root rot or showed only a trace in soil infested with *T. basicola* to which acetic acid was applied, but it was found that this acid had no lasting effect on soil reaction, and it probably served to partially sterilize the soil.

The application of orthophosphoric acid to soil infested with the fungus resulted in root infection more severe than on check plants, and this acid appeared to be as favorable to infection as was lime. In the presence of abundant

orthophosphoric acid, black root rot may be severe in relatively acid soils. The use of orthophosphoric acid together with sulfuric acid or with nitric acid usually resulted in more black root rot than when sulfuric or nitric acid was used alone. In spite of the severe root infection which it induced, orthophosphoric acid was found to result in a great increase in the growth of the plants.

The acids were all found to be more toxic to tobacco plants in poorly buffered than in well buffered soil, and citric, malic, tartaric, and nitric acids were very toxic to germinating seeds and seedlings of tobacco. Acetic acid was the least toxic to plants of any of the organic acids tested. Nitric acid was more toxic to plants than sulfuric acid.

The author claims that when soil reaction is adjusted by acids, the germination and growth of plants can not be correlated with the pH value of soil except for each acid considered separately, the optimum pH value of soil for the growth of plants depending on what acid is used.

The occurrence of acetaldehyde in Bartlett pears and its relation to pear scald and breakdown, C. P. HARLEY and D. F. FISHER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 11, pp. 983-993).—Experiments are described which show that acetaldehyde is formed in the metabolic processes of pears and that it is emanated in appreciable quantities. It is claimed that it is the only aldehyde produced, and the authors agree with the conclusions of Power and Chesnut for the apple (E. S. R., 43, p. 711).

The authors suggest that acetaldehyde is a possible causative agent in the production of scald and breakdown in Bartlett pears. Analyses showed its presence in relatively large quantities in scalded and broken-down pears, and a positive correlation was found to exist between the severity of scald and the concentration of acetaldehyde in the tissues. A similar correlation was also found between the severity of breakdown in the fruit and the concentration of acetaldehyde in the tissues. By analysis of pears showing both scald and breakdown, acetaldehyde was found in greater quantities in the scalded skin tissues than in the apparently normal white tissues beneath. The highest quantity, however, was found in the broken-down core areas. This distribution is said to suggest a localization or accumulation of acetaldehyde in two distinct areas, namely, the core and outer surfaces, and that when the concentrations reach a point of toxicity in these areas, browning of the tissues occurs. The disagreeable taste and odor preceding and accompanying scald and breakdown are believed to be due to acetaldehyde. The toxicity of acetaldehyde to pear tissues was readily demonstrated by exposing the fruits to acetaldehyde gas or injecting dilute solutions into the tissues.

Relation of temperature to growth of *Penicillium italicum* and *P. digitatum* and to citrus fruit decay produced by these fungi, H. S. FAWCETT and W. R. BARGER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 10, pp. 925-931, figs. 3).—Studies were made of the temperature relation of *P. italicum* and *P. digitatum*, two of the most important decay-producing fungi of citrus fruits.

Both species were found, in general, to be affected similarly by the different temperatures. In culture media, as well as on orange fruits, both had nearly the same optimum temperature for development. The differences, however, between the rate of growth at the optimum as compared with the rates at higher and lower temperatures were greater with *P. digitatum* than with *P. italicum*. In most cases the rate of development of decay was much more rapid at the stem end than at the stylar end of the orange fruits, and usually the percentage of decay was also greater from injuries near the stem end than from equal injuries near the stylar end. In lots of fruit inoculated with *P. italicum* and held, respectively, at 66.8, 74.8, and 80.6° F., nearly all fruit showed decay in 4 days; while lots held at 86° and 57.5° showed similar decay

in 8 days; and lots held at 50° showed similar decay in 12 days. In lots of fruit inoculated with *P. digitatum* much the same general relation of temperature to time and percentage of decay was noted, except that apparently the temperatures above and below the optimum had a greater relative inhibiting effect than in the lots inoculated with *P. italicum*.

On the occurrence of the silver-leaf fungus in rhododendrons, A. D. COTTON (*Gard. Chron.*, 3. ser., 77 (1925), No. 1990, p. 112).—The presence and activity of *Stereum purpureum* in connection with rhododendrons at Kew have been observed since 1919. Recently two striking cases have occurred to confirm the parasitism of this fungus, the host in each case being *Rhododendron barbatum*, in which a branch die-back is caused. Treatment is considered as to pruning, wound protection, feeding, and hygiene.

Disease control in tulip culture [trans. title], E. VAN SLOOTEREN (*Meded. Leden Ver. "De Tulp,"* No. 1 (1924), pp. 4).—Brief discussion deals with *Sclerotium tuliparum*, *Botrytis parastitica*, and nematodes.

Heartrot of aspen, H. SCHMITZ and L. W. R. JACKSON (*Minnesota Sta. Tech. Bul.* 50 (1927), pp. 43, figs. 10).—The authors state that aspen or popple (*Populus tremuloides*) is one of the most widely distributed trees in Minnesota. A study was made of this tree, with special reference to forest management in the State. The aspen is subject to heart rot, most of which is caused by *Fomes ignarius*, *Armillaria mellea*, and *F. applanatus*. Studies were made of 385 trees from 77 plats, and the amount of injury due to heart rot was determined. Three stages of decay were arbitrarily distinguished: Incipient decay, in which the wood is faintly colored from light pink to straw brown; intermediate decay includes all degrees of coloration from straw to chocolate brown, but the wood is apparently still hard and firm; and the final stage, which includes all soft, punky wood irrespective of color.

At 70 years the total rot of all types was found to affect 31.2 per cent of the merchantable volume of the trees, at 60 years 27.5 per cent, at 50 years 23 per cent, at 40 years 18.9 per cent, and at 30 years 14.8 per cent. The amount of incipient, intermediate, and final decay in the different lots is given.

It is claimed that branch scars are probably the most important avenues of entrance of wood-destroying fungi, but fire scars and insect injuries are also contributing factors. No evidence was found to indicate that suckers are infected by the parent stump through the roots. Two hundred and seventy field cultures from decayed aspen wood showed that a fungus may usually be obtained from the final stage of decay. Microscopic examination of decayed wood showed the mycelium of fungi to be abundant in the black rings characteristic of the final stage of heart rot. Mycelia of fungi were also found common inside of these rings, but rarely outside of them. Mycelium was not found in the incipient stage of any of the sections examined.

As a result of the studies it is believed that if aspen is grown with adequate protection from fire in a 40- to 50-year rotation under average Minnesota conditions, decay will not be a very serious factor in its production.

Controlling the fungus diseases of "sugi" by pruning [trans. title], K. HASEGAWA (*Forest Expt. Sta. [Japan] Bul.*, 1 (1925), No. 1, pp. 17-29, pl. 1; *Eng. abs.*, p. 29).—Sugi, the Japanese cedar (*Cryptomeria japonica*), is severely attacked in forest nurseries by the parasitic and apparently under certain conditions semisaprophytic fungi *Cercospora cryptomeria*, *Phyllosticta cryptomeria*, and possibly *Pestalotzia shiraina*, which often kill the young trees in large numbers. In dry air the fungi do not flourish injuriously, but under conditions of damp air, as among the thick lower branches and especially during the rainy season, they spread quickly, even from tree to tree.

Spraying with Bordeaux mixture is not absolutely effective after the injury has become fully established. In control experiments it was found that early removal of the lower branches was a measure of considerable sanitary value, especially when this was followed up immediately with an application of Bordeaux mixture.

Tylenchus pratensis and various other nemas attacking plants, G. STEINER (*Jour. Agr. Research* [U. S.], 35 (1927), No. 11, pp. 961-981, figs. 10).—Descriptions are given of *T. pratensis*, a widely distributed nematode of a very destructive nature to 20 or more species of host plants; *Hoplolaimus coronatus*, a parasite of sugar cane, corn, red clover, and alfalfa; and *T. musicola* on roots of grape. Notes are given on a number of other parasitic species.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal life in hot springs, C. T. BRUES (*Quart. Rev. Biol.*, 2 (1927), No. 2, pp. 181-203, figs. 19).—This discussion includes a list of 84 references to the literature.

Returns from banded birds, 1923 to 1926, F. C. LINCOLN (*U. S. Dept. Agr., Tech. Bul.* 32 (1927), pp. 96, pls. 3, figs. 2).—A tabular summary of information is given on the birds banded and retaken in the migration work of the Bureau of Biological Survey. During the second half of the 7-year period since the work was taken over by the Biological Survey, 234,692 birds were banded, with a grand total of nearly 270,000. During this 7-year period 10,338 returns were reported to the bureau and are here tabulated. The tabular data include the place of banding, number and date, and the date and locality of retaking. A list is also given of the localities in which the birds reported upon were banded and names of the cooperators who attached the bands.

Life histories of North American shore birds: Order Limicolae (part 1), A. C. BENT (*U. S. Natl. Museum Bul.* 142 (1927), pp. IX+420, pls. 55).—This work deals with the order Limicolae in part, and includes a 9-page list of references to the literature.

Stomach analyses of German birds as a basis for the determination of the relation between bird and insect [trans. title], VON VIETINGHOFF-RIESCH (*Ztschr. Angew. Ent.*, 11 (1925), No. 2, pp. 309-312).—The stomach contents of 35 bird forms are reported upon.

Histological technique, B. F. KINGSBURY and O. A. JOHANNSEN (*New York: John Wiley & Sons; London: Chapman & Hall*, 1927, pp. VII+142, figs. 16).—This is a guide intended for use in a laboratory course in histology. The subject is presented under the headings of fixation; isolation; sectioning; imbedding methods; staining; mounting, sealing, and labeling; the microscope and accessories; special methods; references; etc.

Some phases of the relation of temperature to the development of insects, L. M. PRAIRIE (*West Virginia Sta. Bul.* 208 (1927), pp. 62, figs. 19).—The studies here reported, which are considered in connection with a 9-page list of references, are given in large part in tabular and chart form.

They have shown that the rate of development of certain insects is directly affected by the degree of temperature and that, for the greater part of the range of temperatures permitting development, this relation is best expressed by a curve for the velocity of development which takes the form of a straight line.

"Data indicate that the straight line departs from its course near the ends. At the upper end the departure is in the direction which indicates a slowing up of acceleration of development. The opposite condition is observed at the lower end of the curve, but here, in the light of evidence presented by other

investigators, it seems probable that the increase in the rate of acceleration is due to factors other than temperature and that the actual temperature effect would be represented by a departure from the straight line in the direction which would represent decrease in the rate of acceleration of development.

"For all points along the straight line part of the velocity curve, a given accumulation of temperature, or thermal increment expressed in day-degrees, will accomplish a constant effect, expressed in growth or development. And, further, that summations of temperatures, to derive the constant, may be made from the zero of the velocity curve. †

"The point at which development ceases is near to, but sometimes lower than, the zero of the velocity curve. No definite method of locating this threshold of development is suggested.

"Evidence of development in the work reported here has been lacking from insects reared at temperatures approximating the zero of the velocity curve, but other investigators, working with other material, have found evidence of development at points even below the zero of the curve. Development has been found to be accelerated by variations in the daily temperature when compared with constant temperatures of the same apparent value.

"Some evidence is offered to indicate that the quality of carbon dioxide produced during a developmental period is near a constant, regardless of the temperature at which development takes place, and it is suggested that the departures from the constant may represent basal metabolism not directly associated with developmental processes.

"Data are presented which show that temperatures undergoing a daily variation similar to the normal variation found under outdoor conditions have a greater effect upon rate of development than do constant temperatures from which the same thermal increment is to be computed.

"It is shown in the discussions that the law of van't Hoff and possibly Arrhenius' formula also may be applied to developmental data, but that the graphic interpretation, based upon the straight line curve, furnishes a more convenient method of analysis."

Vegetation types and insect devastations.—Distribution of the Mexican bean beetle and European corn borer in Ohio, E. N. TRANSEAU (*Ecology*, 8 (1927)), No. 3, pp. 235-238).—The author finds that the distribution of the Mexican bean beetle in Ohio corresponds with environmental conditions represented by the area originally covered with the mixed mesophytic forest. The European corn borer causes commercial damage in areas originally dominated by the series of associations from phragmites marsh to swamp forest. The infestation is much less in areas originally covered with beech-maple forest, and least in those which were formerly oak-hickory forest.

The interrelationships of insects and roundworms, R. H. VAN ZWALUWENBURG (*Hawaii. Sugar Planters' Sta., Ent. Ser. Bul.* 20 (1928), pp. 68).—In this paper the author has attempted to bring together the references to the subject of insect-nematode association up to 1927. In an introductory discussion he deals with the types of association, rôle played by various insect orders, primary parasitism of flies by nematodes, flies as intermediate hosts of nematodes, and flies as mechanical carriers of nematodes. The main part of this work consists of a list of the recorded associations between insects and roundworms, arranged by orders and families.

A list of insects of New York, with a list of the spiders and certain other allied groups, edited by M. D. LEONARD (*New York Cornell Sta. Mem.* 101 (1926), pp. 1121, pl. 1, fig. 1).—This is a list of the insects of New York, arranged systematically by orders and families, in the preparation of which

the editor was assisted by numerous specialists. In addition to the insects, lists are given of the millipedes and centipedes, spiders and harvest men, and eriophyid mites. In all, 16,124 species and varieties are listed, of which 15,449 are insects. The introductory account includes a discussion of the faunal districts of the State by W. T. M. Forbes (pp. 7-11). An index to the genera and higher groups is included, and a large-size map of New York State showing the places where the important insect collections have been made, is attached.

[Report of South Dakota work in] entomology-zoology (*South Dakota Sta. Rpt. 1927, pp. 15-19*).—Brief reference is made to a study of the field cricket conducted in continuation of that of the preceding year (E. S. R., 56, p. 659).

A summary is given of studies of the life history, habits, and control of the plum tree borer, officially known as the lesser peach borer, which is widely distributed over the State and one of the most destructive enemies of the plum. A single parasite, a *Microbracon*, has been found to attack the pest in South Dakota. In control work, a mixture consisting of 4 parts of paraffin and 1 part of paradichlorobenzene, which is soluble in hot paraffin, applied to the trunk and larger limbs of young and old trees with a paint brush, was found to be toxic to the larvae and did not injure the trees. The mixture, which was kept liquefied by heating with hot water in a double boiler, destroyed the larvae in trees on which it was painted after exposure to the fumes for a period longer than 12 days.

In studies of the pollinating agents of sweet clover, several different types of cages were used to inclose the plants. While the results of the first year's work were not conclusive, it was apparent that insects, particularly bees, are of considerable value in pollinating this plant.

A list is given of 35 species of grasshoppers of the subfamily *Cyrtacanthacrinæ* thus far collected in the State.

Pests of economic plants in Samoa and other island groups, G. H. E. HOPKINS (*Bul. Ent. Research, 18 (1927), No. 1, pp. 23-32, pl. 1, fig. 1*).—This is a report of observations made by the author and P. A. Buxton during the years 1924 and 1925, while employed in research work on filariasis.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 12 (1927), No. 3, pp. 385-507, figs. 30*).—The papers here presented (E. S. R., 58, p. 158) include the following: The Importance of the Balance of Life for the Protection of Plants against Animals, by K. Friederichs (pp. 385-411), which includes a list of 62 references to the literature; Frit Fly Infestation and the Quality of the Grain, by R. Kleine (pp. 412-427); On the Control of the Pine Spinner [*Dendrolimus pini*], by M. Seltner (pp. 428-435); Investigations of the Varying Abundance of *Olysia ambiguella* Hüb. and *Polychrosis botrana* Schiff., by L. Sprengel (pp. 436-456), with a list of 21 references to the literature; Austrian Larch Honeydew, Larch Manna, and Larch Honey, by L. Arnhart (pp. 457-472); An Outbreak of *Evetria buoliana thurificana* Led. in Pine Stands on Mount Carmel in Palestine, by F. S. Bodenheimer (pp. 473-483); On the Period of Development of the May beetle, by M. Schmidt (pp. 484-489); Black Fly Plague in Bulgaria, by K. Brassler (pp. 490-493); Control of the Coffee Berry Beetle in the State of Sao Paulo, by K. Escherich (pp. 493-498); The Pebrine of the Gypsy Moth and of the Brown-Tail Moth, a New Infection of Economic Importance (pp. 498-500); On the Knowledge of the Ecology of *Pediculoides ventricosus* (Newp.) Berl. by H. Eidmann (pp. 500-502); On the Biology and Economic Importance of the Oat Thrips (*Stenothrips graminum* Uzel), by Kalandadze (pp. 503, 504); and Stomach Analyses of German Birds as a Basis for the Determination of the Relation between Bird and

Insect, by Von Vietinghoff-Riesch (pp. 504-507), which is in continuation of the account noted on page 753.

Dusting and spraying experiments with potatoes on Long Island in 1927. H. C. HUCKERT (*New York State Sta. Circ. 94* (1928), pp. 10, pls. 2).—This is a report of work conducted in continuation of that of the preceding year, previously noted (E. S. R., 57, p. 258).

The insects causing the most injury were potato leafhoppers and the second brood of potato flea beetles. The marked differences in the results obtained in spraying and dusting at Riverhead and Farmingdale indicated that local conditions have an important influence in determining their value. At Riverhead plats were benefited by two special nicotine applications in early July, the dust form being more beneficial to the foliage than nicotine spray. With the Green Mountain variety the superiority resulted in a substantial increase in yield, but in plats of Irish Cobbler sprayed with Bordeaux mixture those treated with special applications of nicotine dust yielded slightly less than those treated with nicotine spray. Very little advantage, if any, was gained by spraying with three nozzles per row instead of two.

At Farmingdale nothing was gained by controlling the first brood of flea beetles. Spraying was more successful than dusting in controlling insects, especially leafhoppers and the second brood of flea beetles.

At Greenport there was no indication that the efficiency of spray applications was improved by brushing over the vines before spraying. This it is thought may be due largely to the fact that leafhoppers and aphids were not serious pests in 1927.

The use of poultry against pests of fruit crops. A. ROEBUCK (*Midland Agr. and Dairy Col. Bul. 16* (1927), pp. 31).—This paper includes an account of general observations on the eating of the different stages of insect life, a monthly calendar showing the location of insects which can possibly be reached by fowls, and general notes on other miscellaneous pests. A list of fruit pests with which some measure of control is obtained by keeping fowls and a list of those with which no control is obtained in this way are included.

The enemies of fruit culture in Algeria and practical means of control. M. DELASSUS, J. BRICHET, A. BALACHOWSKY, and A. LEPIGRE (*Les Ennemis des Cultures Fruitières en Algérie et les Moyens Pratiques de les Combattre. Algiers: Imp. La Typo-Litho, [1927?], pp. 199, figs. 107*).—The several chapters of this work deal with the enemies of citrus (pp. 17-77), olive (pp. 79-108), pome and stone fruits (pp. 109-166), fig (pp. 167-176), and date (pp. 177-193). References to the literature accompany the several chapters, and an index is included.

A comparison of the toxicity to insects and the diffusion in a column of grain of chlorpicrin, carbon disulphide, and carbon tetrachloride. A. L. STRAND (*Minnesota Sta. Tech. Bul. 49* (1927), pp. 59, figs. 12).—The author finds that the toxicity of chloropicrin, carbon disulfide, and carbon tetrachloride to insects can be correctly compared only when concentration, time to kill, and temperature are all considered as factors.

"Throughout a range of temperatures from 35 to 10° C., 1 lb. of chloropicrin is more toxic to the confused flour beetle (*Tribolium confusum* Duv.) than 20 lbs. of carbon tetrachloride, and the lower the temperature the greater the relative toxicity. Throughout the same range of temperatures chloropicrin at the rate of 1 lb. to 1,000 cu. ft. of space is less toxic than carbon disulfide at the rate of 15 lbs. per 1,000 cu. ft. The greater the concentration of chloropicrin (between 1 and 3 lbs. per 1,000 cu. ft.) the better is its toxicity to insects maintained through a range in temperatures from 35 to 10°.

A decrease in temperature lowers the toxicity of carbon tetrachloride much more rapidly than that of carbon disulfide or chloropicrin. When time to kill 100 per cent of *T. confusum* with chloropicrin, carbon disulfide, or carbon tetrachloride is plotted against temperature, the result is not a straight line. Between 35 and 10° the time increases at a greater rate toward the lower temperatures.

"When chloropicrin or carbon disulfide is applied to wheat in a tight bin, the downward diffusion of the gas is not so rapid as ordinarily described. The concentration of the gases does not become stronger at the bottom of a bin of wheat than toward the top, but varies inversely with the depth below the surface of the grain. Adsorption of the gases by the top layers of grain prevents their rapid downward movement. As adsorption is closely related to temperature (the lower the temperature the greater the adsorption), temperature is an important factor in the fumigation of grain aside from its relation to the toxicity of the fumigant or the activity of the insects being fumigated."

A list of 43 references to the literature is included. Tabular data on the experiments conducted are appended.

Use of emulsified oils as ovicides, T. PARKER (*Fert., Feed. Stuffs and Farm Supplies Jour.*, 12 (1927), No. 1, pp. 7, 8).—This discussion deals with the limitations of lime, sulfur, and caustic soda; products of coal-tar distillation; and emulsification of anthracene oils. It is pointed out that work has shown the fraction obtained in the distillation of tar, known as green or anthracene oils, to possess very high egg-destroying properties when used as an emulsion. A tabulated comparison is given of the various types of tar and creosote which illustrates a wide variance in composition which must of necessity greatly influence the value and action of any emulsion prepared therefrom. It is pointed out that anthracene oil is not a very difficult oil to emulsify, providing the anthracene is removed as far as possible either by freezing or washing.

The lubricating oil spray situation in Ontario, W. A. ROSS (*Canad. Hort.*, 51 (1928), No. 2, pp. 25, 26, figs. 3).—A brief review of the use of lubricating oils in Ontario.

The arsenic and lead in spray residue on fruit trees [trans title], K. LENDRICH and F. MAYER (*Ztschr. Untersuch. Lebensmitl.*, 52 (1926), No. 6, pp. 441-457).—Quantitative determinations of the arsenic and lead present in the spray residue on the several varieties of apples received at Hamburg from the United States are reported upon in tabular form. The results show that these elements rarely, if ever, occur on the fruit in toxic amounts.

A new diluent for Paris green, P. A. DALAL and E. E. MADON (*Jour. Trop. Med. and Hyg.* [London], 31 (1928), No. 2, pp. 25, 26).—It was found in Bombay that 40 grains of Paris green incorporated with 8 oz. of French chalk sprinkled over 500 sq. ft. of water surface effectively destroyed mosquito larvae, but did not affect the eggs. The use of sublimed sulfur as a diluent in the same ratio gave equally satisfactory results.

Thysanoptera—new species and notes, D. MOULTON (*Bul. Brooklyn Ent. Soc.*, 22 (1927), No. 4, pp. 181-202, figs. 5).—Among the 16 species described as new is *Kurtomathrips morrilli* n. g. and sp., collected on cotton in Gila Bend, Ariz., where it was the source of injury to that crop, causing the leaves of plants to turn brown and dwarfing the bolls. As high as 25 per cent of the plants were observed to be affected in the latter part of September, 1926. Two genera are erected.

Population of *Eutettix tenella* Baker and the osmotic concentrations of its host plants, W. CARTER (*Ecology*, 8 (1927), No. 3, pp. 350-352, fig. 1).—Data presented in this contribution from the U. S. D. A. Bureau of Entomology

indicate that extremely high sap concentrations are undesirable to, and are avoided by, the beet leafhopper if more suitable food is available.

The plant lice or Aphididae of Great Britain, F. V. THEOBALD (*London: Headley Bros.*, 1927, vol. 2, pp. [4]+411, figs. 182).—This second part of the work (E. S. R., 56, p. 660) deals with the subtribe Aphidina (pp. 1-327) and part of the tribe Callipterini (pp. 327-406).

Notes on the life-history and habits of *Elasmus nephantidis* Rohw., Y. RAMACHANDRA RAO and M. C. CHERIAN (*Madras Agr. Dept. Yearbook 1926*, pp. 39-50, pl. 1).—This is an account of one of the several parasites that serve to control the black-headed caterpillar of coconut (*Nephantis sertinopa*) in south India. Its life cycle is completed in from 10 to 16 days.

Oriental peach moth investigation in 1925 and 1926: A summarized report, L. A. STEARNS (*New Jersey Stat. Circ.* 208 (1927), pp. 15, figs. 4).—This summarized report of work conducted supersedes Circular 175, previously noted (E. S. R., 53, p. 53), and deals with the work conducted in 1925 and 1926, the data relating to which have been noted (E. S. R., 57, p. 756; 58, p. 60).

Food preferences of the European corn borer: The importance of mugwort or common artemisia (*Artemisia vulgaris*) as a trap plant for the protection of cultivated crops [trans. title], E. ROUBAUD (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1927), No. 21, pp. 1158-1160).—The author calls attention to the fact that in the vicinity of Paris common artemisia is the preferred host plant of the European corn borer. The plant is able to survive a vigorous attack by the borer, the author in infestation experiments having found an average of 25 per cent infestation of artemisia compared with 6.3 per cent in corn. In a large cage inclosing growing artemisia and corn, in which 80 adults were liberated during the month of July, all of the stalks of artemisia were infested at the end of the month while 43 of the 57 stalks of corn remained free from infestation.

The spread of the bee moth, F. B. PADDOCK (*Bee World*, 9 (1928), No. 2, pp. 19-21).—A historical account of this pest of the apiary.

Control of the wax moth by use of chloropicrin [trans. title], G. F. JAUBERT (*Compt. Rend. Acad. Sci. [Paris]*, 185 (1927), No. 26, pp. 1608-1610).—The author finds that in an atmosphere of 20 to 30 mg. of chloropicrin per liter, either pure or diluted with carbon tetrachloride, the eggs, larvae, and adults of the wax moth are quickly killed. The carbon tetrachloride supplements the insecticidal effect of chloropicrin upon the eggs by dissolving the fat present. The use of chloropicrin is considered more practical and certain than the use of sulfur, carbon tetrachloride, or dichlorobenzene.

Microbe infection and immunity in the wax moth, S. MÉTALNIKOV (*L'Infection Microbienne et l'Immunité chez la Mite des Abeilles Galleria mellonella*. Paris: Masson & Co., 1927, pp. [4]+140, figs. 22).—The several parts of this work deal with biological observations, structure of the digestive organs, nutrition of the caterpillar, digestion, natural immunity to microbes and toxins, acquired immunity, bacteriolysis, phagocytosis and cellular reactions in immunity, influence of the nervous system on immunization, heredity of acquired immunity, anaphylaxis and immunity, tuberculosis, and immunity factors.

On the immunization of caterpillars of the wax moth [trans. title], V. CHOBINE (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 30, pp. 1288-1290).—The author has found that the wax moth caterpillar can be readily immunized against *Bacillus subtilis galleriae*, *B. thirotria*, and a strain of *Staphylococcus albus*. With these organisms the immunity is very clearly manifested 24

hours after the injection of the vaccine, and persists for a long time. Immunity to *Coccobacillus acridiorum* is easily acquired but is of short duration.

Passive immunity in the wax moth [trans. title], V. ZERNOFF (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 36, pp. 1697-1699).—The author finds that a passive immunity can be produced in the wax moth by the injection of blood from caterpillars immunized with Danysz's bacillus, and that such immunity lasts for many days.

Factors in controlling the pecan nut case-bearer, G. F. MOZNETTE (*Amer. Nut Jour.*, 28 (1928), No. 1, pp. 6, 7).—This is a contribution from the U. S. D. A. Bureau of Entomology, in which the author discusses some of the factors that he has observed to be responsible for the failure of lead arsenate to control the pest effectively. The feeding habits of the larvae are considered at some length, the details of feeding experiments in the laboratory being presented in tabular form.

In these experiments larvae ranging in size from 2 to 8 mm. in length, obtained from infested nuts in the field, were placed on one of the small nuts in each of the clusters upon twigs that had been sprayed or dusted. In three series, in each of which 10 larvae were placed upon thoroughly treated clusters of nuts, but 2 of the larvae died. Lead arsenate applied as a spray or a dust did not deter the larvae from entering, and they seemed to pay but little attention to its presence on the clusters.

State laws concerning mosquito control work in New Jersey (*New Jersey Stat. Circ.* 207 (1927), pp. 8).—The laws of New Jersey relating to mosquito control work are brought together in this circular.

Experimental dissemination of the tabanid egg parasite *Phanurus emersoni* Girault and biological notes on the species, D. C. PARMAN (*U. S. Dept. Agr. Circ.* 18 (1928), pp. 7, figs. 2).—In this circular the author reports upon biological studies of the egg parasite *P. emersoni* of horseflies and experimental work in tabanid control by egg collection and parasite dissemination.

This parasite has been reared from the eggs of *Tabanus hyalinipennis* Hlne in 20 counties of southwestern Texas, where it breeds at elevations of from 800 to approximately 2,000 ft. The eggs of this tabanid are deposited mostly on stones from 3 to 15 in. in diameter projecting above the water from 1 to 12 in. in rapids where the streams spread over the gravel beds in sunny, open places. Some eggs are deposited on plants growing in the rapids and along the water's edge. The parasite prefers the open, sunny stretches of the streams, and the eggs on stones are usually most heavily parasitized, but at times the eggs on the plants are quite as heavily parasitized. At Uvalde the total developmental period for the immature stages ranged from 12 to 19 days, the average being 17.3 days from oviposition to emergence of the adults. Ninety-three per cent was the highest parasitization of any of the egg masses collected, the average having never been above 60 per cent.

In the course of the work of disseminating the parasite 10 to 12 gal. of masses, or 20,000,000 to 25,000,000 eggs, were collected by ranchmen and placed in vessels along the streams. This artificial dissemination of the parasite to areas of low percentage of parasitism apparently resulted in a more general establishment of the parasite over the area in which the host breeds and a 50 per cent greater decrease the following year in the number of flies in the area.

The work has led to the conclusion that the rearing of this egg parasite and its dissemination, augmented by tabanid collecting, is a feasible method of tabanid control under certain climatic and physical conditions.

Fruit fly still found in Spain's grape area (*U. S. Dept. Agr., Off. Rec.*, 7 (1928), No. 1, pp. 1, 3).—A resurvey of the Mediterranean fruit-fly situation as affecting the Malaga or green export grape produced in Almeria, a province

of southeastern Spain, conducted by M. Kislink, jr., resulted in finding the pest still present throughout the grape districts, including those in which more or less intensive clean-up operations had been undertaken. Intensive inspection of the tomato crop in the Canary Islands, in cooperation with the Spanish authorities, resulted in failure to find any evidence of infestation of tomatoes by fruit flies or other injurious insects, although the Mediterranean fruit fly was abundant in the islands and heavily infesting the orange and other fruits. Examinations made of tomatoes in Almeria likewise indicated freedom from fruit-fly infestation.

The Mexican bean beetle, *Epilachna corrupta*, R. H. PETTIT (*Michigan Sta. Circ. 107* (1927), pp. 8, figs. 4).—This is a brief summary of information.

The striped blister beetle on soy beans, J. W. INGRAM (*U. S. Dept. Agr. Leaflet 12* (1927), pp. 5, figs. 3).—A brief account is given of *Epicauta lemniscata* Fab. and means of control. Sodium fluosilicate applied as a dust has proved to be the best control measure for this pest, which appears every year in nearly all soy bean fields in southwestern Louisiana.

Notes on the life history of *Longitarsus nigripennis*, the "pollu" flea beetle of pepper, Y. RAMACHANDRA RAO and A. G. RAMASWAMIAH (*Madras Agr. Dept. Yearbook 1926*, pp. 51-64, pl. 1).—This is an account of a flea beetle which attacks the black pepper and causes a loss by boring in the berries. The eggs are laid singly in the skin of the green berry and covered with excreta. On hatching out the larva bores into the berry and after devouring its contents attacks three more berries before it becomes full grown, whereupon it drops to the ground and pupates in the soil. Five to eight days are passed in the egg stage, 22 to 32 in the larval, and 6 to 7 in the pupal stage, the life cycle varying from 37 to 49 days. The maximum of 88 eggs was laid during a period of more than a month. A summary of life history records is given in tabular form.

How the boll weevil ingests poison, E. F. GROSSMAN (*Florida Sta. Bul. 192* (1928), pp. 145-172, figs. 6).—The author's investigations here reported, the details of which are given in part in tabular form, include mopping and dipping experiments, use of diluted calcium arsenate, the application of poison to dry and wet cotton plants, day and night poisoning, and sirup mixtures for spraying and for mopping.

It was found that the boll weevil accumulates poison particles on the snout tip while crawling from place to place and later ingests the poison, and that there is no indication that its water-drinking habit is an important factor, since there is no appreciable difference in the mortality in weevils exposed to wet or dry poisoned plants. Test plats treated with a 50-50 mixture of calcium arsenate and hydrated lime yielded as much seed cotton per acre for three consecutive years as did plats treated with undiluted calcium arsenate. In view of the low rate of mortality of the weevils crawling over cotton plants sprayed with a mixture of calcium arsenate, water, and sirup, the use of sirup mixtures for spraying is not recommended for boll weevil control. When more concentrated mixtures were mopped onto the bud of small cotton plants, a high rate of mortality was obtained.

The H-ion concentration of the sap of the normal cotton plant and that attacked by the stem weevil, T. LAKSHMANA RAO (*Madras Agr. Dept. Yearbook 1926*, pp. 65-72).—The preliminary studies here reported indicate an appreciable change in reaction in the plant juice in the direction of alkalinity due to the incidence of disease from weevil attack.

The body temperature of the honeybee, E. F. PHILLIPS (*Amer. Bee Jour.*, 67 (1927), No. 12, pp. 630, 631).—Experiments conducted by K. Brunnich in

Switzerland¹ have led to the present discussion of the status of knowledge of the temperature of the honeybee.

Syrups for the autumn feeding of bees, C. F. PATTERSON (*Sci. Agr.*, 8 (1927), No. 3, pp. 151-162).—A contribution from the University of Saskatchewan.

Lundie's "Flight activities of the honey bee," B. WRIGHT (*Bee World*, 9 (1928), No. 2, pp. 21-23).—This is a critical review of the account by Lundie previously noted (*E. S. R.*, 53, p. 455).

Studies in tropical wasps—their hosts and associates (with descriptions of new species), F. X. WILLIAMS (*Hawaii. Sugar Planters' Sta., Ent. Ser. Bul.* 19 (1928), pp. [4]+179, pl. 1, figs. 253).—The several parts of this report of studies deal with some friends and enemies of Philippine wild figs; habits of wasps of the genera *Larra* and *Liris* and of *Tachytes mergus*; the Larridae of the Philippine Islands; some wasp enemies of cockroaches; habits of some American spider wasps of the family Psammocharidae or Pompilidae; *Pterombus*, a wasp enemy of the larva of tiger beetles; observations on some social and solitary wasps, and ants; and the nest of *Trigona jaty* Sm., a social bee of the Neotropics.

ANIMAL PRODUCTION

The digestibility of certain fruit by-products as determined for ruminants.—II, Dried pineapple pulp, dried lemon pulp, and dried olive pulp, S. W. MEAD and H. R. GUILBERT (*California Sta. Bul.* 439 (1927), pp. 11).—The average digestibility of dried pineapple pulp, dried lemon pulp, and dried olive pulp when fed with alfalfa hay, as determined with wether sheep according to the methods previously described (*E. S. R.*, 56, p. 261), is reported in the following table:

Coefficients of digestibility of dried pineapple, lemon, and olive pulp

Kind of feed	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen-free extract
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Dried pineapple pulp.....	74.56	20.75	Negative.	69.62	79.75
Dried lemon pulp.....	81.43	46.18	27.44	60.33	92.01
Dried olive pulp.....	19.09	Negative.	86.02	Negative.	20.27

In palatability tests with dairy cows it was necessary to mix the dried pineapple pulp with wheat bran in order to induce the animals to eat it during the first two weeks. Sheep, however, ate the pulp readily. Dried lemon pulp because of its bitter taste was not relished by livestock. The dried olive pulp used contained the pits, and in such condition was practically useless as a feed for livestock.

Some digestibility trials on Indian feeding stuffs, II, P. E. LANDER and P. L. C. DHARMANI (*India Dept. Agr. Mem., Chem. Ser.*, 9 (1927), No. 3, pp. 63-83, pl. 1, fig. 1).—This work continues the digestion trials previously noted (*E. S. R.*, 54, p. 263). Four mature bullocks were used to determine the digestibility of rations composed of sarson and bhusa, bhusa alone, shisham silage and bhusa, and shisham silage alone. The analyses of the food stuffs and detailed results of the digestion trials are appended.

The ensiling of green forages, L. BRÉTIGNIÈRE and J. GODFERNAUX (*L'Ensilage des Fourrages Verts. Paris: Libr. Agr. Maison Rustique*, 1927, pp. 256, figs. 79).—A handbook of general interest, defining ensilage and discussing the reasons for ensiling, forage plants to ensile, silos, the utilization of silage, and the reasons for failure and success in the making of silage.

¹ Amer. Bee Jour., 67 (1927), No. 1, pp. 22, 23.

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ.* 147 (1927), pp. 36, fig. 1).—A condensed report of the commercial feed inspection for the year 1926 (E. S. R., 56, p. 559). A table gives a list of the feeds inspected, the number passed, not passed, and not tagged. Definitions of feeding stuffs and average analyses of common cereals and by-product feeds are given.

Inspection of commercial feedstuffs, P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul.* 40 (1927), pp. 27).—The usual report of the chemical and microscopic analyses of 1,603 feeding-stuff samples collected for official inspection during the year ended September 1, 1927 (E. S. R., 56, p. 550).

Inspection of commercial feeding-stuffs, 1927, T. G. PHILLIPS and T. O. SMITH (*New Hampshire Sta. Bul.* 230 (1927), pp. 53).—The usual report of guaranties and analyses of 360 brands of feeding stuffs officially inspected between December, 1926, and April, 1927 (E. S. R., 56, p. 363).

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 266 (1927), pp. 56).—This is the usual report, containing a list of brands meeting their guaranties and the analyses and deficiencies of brands not meeting their guaranties (E. S. R., 56, p. 466) from official samples taken during the months of December, 1926, and April, 1927.

The art of breeding, R. GÄRTNER (*Züchtungskunde. Stuttgart: Eugen Ulmer, 1927, pp. VII+377, pl. 1, figs. 118*).—A treatise divided into the following sections: The fundamental biology of breeding, the sexual life of domestic animals, variability, transmission, and methods of breeding.

Growth and development, with special reference to domestic animals.—**I, Quantitative data**, S. BRODY ET AL. (*Missouri Sta. Research Bul.* 96 (1926), pp. 182, figs. 71).—This publication presents additional data on the growth in weight and other age changes of domestic animals (E. S. R., 50, p. 466), including cattle, horses, poultry, sheep, and swine. Special attention has been given to the age changes in milk secretion, and there is a brief discussion on the literature of growth of laboratory animals. Appended are tables of the formula used in the various determinations and a fairly complete bibliography on growth and senescence (pp. 160-182).

Growth and development, with special reference to domestic animals.—**IX, A comparison of growth curves of man and other animals**, S. BRODY (*Missouri Sta. Research Bul.* 104 (1927), pp. 31, figs. 12).—Continuing the series noted on page 767, the author points out that while the growth curves of different animals are quite similar the growth curves of man are different from those of domestic animals. The greatest differences in the curves are in the relatively long juvenile period in man between the years 4-5 and 14, during which the percentage rate of growth is extremely low. Puberty also occurs relatively late in the growth period of man. After puberty the growth curves in man and animals are approximately the same. The percentage rate of growth during the infantile period (birth to 10 months) of man appears to decline with advancing age, while with animals the rate is constant during this period. The percentage rate of growth during the prenatal growth of man is low as compared with that of animals, and there may also be a qualitative difference in the growth curves during this period. A given state of nutrition appears to exert a greater relative influence on the linear growth of children than on animals.

Iodine for livestock, F. E. CORRIE ([London]: De Gruy & Co., 1927, pp. 20).—The author reviews the literature dealing with the use of iodine fed to livestock for growth, development, and reproduction and its effect upon production and resistance.

The influence of position of cattle, as to standing and lying, on the rate of metabolism, E. B. FORBES, M. KRISS, W. W. BRAMAN, ET AL. (*Jour. Agr. Research* [U. S.], 35 (1927), No. 10, pp. 947-960, figs. 2).—In continuing the study previously noted (E. S. R., 53, p. 271), 2 steers weighing 468 and 479 kg., respectively, were fasted for 7 and 6 days at the Pennsylvania Institute of Animal Nutrition. During the last 4 days of the fasting periods the animals were the subjects of continuous respiration calorimetric studies. Samples of the outgoing air were taken at 15-minute intervals during 2 of these days to determine the CO₂ production. The animals were allowed to change position at will except during one period when one steer was prevented from lying down by means of a chain. Since the lighter animal more nearly divided its time between standing and lying, the data obtained with it are assumed to be more nearly accurate.

It was found that after a change of position it required approximately 1 hour before the CO₂ in the outgoing air reached a constant. The lighter steer produced 10.8 liters more CO₂ per hour while standing than while lying. On the basis of body weight this production of CO₂ was 2.31 liters per 100 kg. more in the standing position. The increase in heat production, based on the determined heat-CO₂ ratio of 6.55, while standing as compared with lying, was 70.7 Calories per head, or 15.1 Calories per 100 kg. of body weight per hour.

Activities of livestock on the range, V. L. CORY (*Texas Sta. Bul.* 367 (1927), pp. 47, figs. 6).—The feeding data presented in this publication have been previously noted (E. S. R., 57, p. 863; 58, p. 564). In connection with this study, it was found that cattle spent 10 per cent of their day in travel, sheep 13 per cent, and goats 19 per cent. Cattle traveled an average of 3.3 miles, sheep 3.8 miles, and goats 6 miles, which includes going to water and salt. The differences in amount of ground covered are due to the differences in the grazing and bedding-down habits of the animals. Cattle in a suitable grazing area confined their activities to a limited space by circling around it and crossing and recrossing their tracks. Sheep go to the limit of an area and then turn sharply back but at an angle to previous grazing. Goats graze straight ahead to near the pasture limits and then circle around, doing this several times a day, with a rest period between.

Among other observations it was found that cattle spent an average of 8 minutes per day in licking salt, and sheep and goats less than 3 minutes. In drinking water, cattle spent 2.4 minutes, sheep 1 minute, and goats 0.9 minute in quenching their thirst. In this connection it was noted that cattle and goats spent more time in drinking in the summer and less in the winter, while sheep had exactly opposite habits of drinking. Cattle averaged 12.5 per cent of their day resting, while sheep and goats averaged more than 15 per cent. Rumination while standing occupied 9 per cent of the day for cattle, 10 per cent for sheep, and 11 per cent for goats. Idling while standing took up 10 per cent of the day for cattle, 11 per cent for sheep, and 8 per cent for goats.

Studies of the metabolism of steers, I-III, F. G. BENEDICT and E. G. RITZMAN (*Natl. Acad. Sci. Proc.*, 13 (1927), No. 3, pp. 125-140; also *New Hampshire Sta. Sci. Contrib.* 23 (1927), pp. 125-140).—The data here published have been previously noted (E. S. R., 57, p. 863).

Rations for fattening baby beeves and selection of calves for baby beef production, H. W. VAUGHAN (*Minnesota Sta. Bul.* 237 (1927), pp. 51, figs. 32).—The results of 5 years' experiments with rations for fattening baby beeves, in continuation of those previously noted (E. S. R., 53, p. 467), are reported. In each trial 6 lots of 10 uniform calves each were fed. The length of the feeding period in different years varied from 196 to 224 days.

Steer calves made more rapid and more economical gains than heifers, but the heifers fattened in less time. There were no indications that feeding mixed lots of calves was less profitable than feeding steers and heifers in separate lots.

A ration of shelled corn and either alfalfa or clover hay was successful for fattening baby beefs, but the addition of corn silage to such a ration was unprofitable. However, when corn silage and a protein supplement were added to the above ration the rate of gain and the profit realized were increased. Shelled corn was much more valuable than barley for fattening. Grinding shelled corn and oats proved to be unprofitable, while adding oats to a ration of shelled corn, linseed oil meal, corn silage, and alfalfa hay reduced the rate of gain, increased the cost of gain, produced less finish, and resulted in a lower selling price per hundredweight.

Corn-and-cob meal gave better results than shelled corn and oats. Limiting the allowance of corn-and-cob meal to 2 lbs. and of shelled corn to 1.6 lbs. per 100 lbs. of live weight daily and the linseed meal to 1.7 lbs. per head per day, with silage and legume hay, was found to be the most profitable ration. A full feeding of corn-and-cob meal returned a greater profit than shelled corn, but in rations including silage shelled corn feeding returned the larger profit, due to the larger pork returns.

Limiting the grain ration during the first half of the feeding period was not so profitable as full feeding from the start, and on the average it was more profitable to feed baby beefs for 210 days than for 140 or 168 days.

Baby beef. A. N. DUCKHAM (*Jour. Roy. Agr. Soc. England*, 87 (1926), pp. 123-177, figs. 4).—A very comprehensive paper covering in all its phases the production and consumption of baby beef in the United Kingdom.

The Australian meat industry: The economic importance of the satisfactory freezing of beef. [J. A.] GILBUTH ET AL. (*Jour. Council Sci. and Indus. Research [Aust.]*, 1 (1927), No. 1, pp. 43-48).—A report prepared by the meat freezing committee of the Australian National Research Council, showing the relationship between Australian frozen beef and Argentine chilled beef on the London market. The conditions preventing the shipment of chilled beef from Australia to London are pointed out, and recommendations are made for the improvement of the meat trade between the different sections of Australia.

The winter fattening of sheep (*Farmer and Stock-Breeder and Agr. Gaz.*, n. ser., 42 (1928), No. 1996, p. 67, figs. 2).—The results of two experiments under the direction of the Leeds University, England, on the winter fattening of sheep are reported.

In the first test 5 lots of wethers were fed for 164 days on the following rations: Lot 1 roots (turnips and swedes) alone, lot 2 roots and "seeds" hay, lot 3 roots and hay plus decorticated peanut cake and palm kernel cake 1:3 parts, lot 4 roots and hay plus peanut cake, palm kernel cake, rolled wheat, and rolled barley 1:3:16:16 parts, and lot 5 roots and hay plus equal parts of linseed cake and palm kernel cake. No difficulty was experienced in getting the sheep to eat any of the rations. The average gain per head per week in the respective lots was 1.15, 1.31, 1.41, 1.3, and 1.73 lbs. The carcasses of lot 1 had somewhat less internal fat than the other lots but buyers did not consider that there was any difference in the value of the carcasses from all lots.

In the second test all lots received roots and meadow hay fed ad libitum as the basal ration, which was fed to lot 1. Lot 2 received the same additions as in lot 3 above, lot 3 the same as in lot 4 above, and lot 4 equal parts of rolled wheat and barley. The average gain per head per week was 0.88, 1.75, 1.18, and 1.18 lbs. in the respective lots. The carcasses of lots 2, 3, and 4 were too fat, but lot 1 carcasses were well finished.

From the data obtained it is evident that concentrates of a low protein content do not give as good results as concentrates of a high protein content when supplementing roots and hay. Roots and roots and hay produced good gains during the early stages of feeding, but difficulties were experienced in maintaining the increases on these rations as feeding progressed. However, roots alone did produce a carcass that was satisfactory from the butcher's standpoint. "Seeds" hay produced larger body weight increases than meadow hay.

[Feeding experiments with swine at the South Dakota Station] (*South Dakota Sta. Rpt. 1927, pp. 9, 10*).—Results of the following experiments are briefly noted.

[Pasture crops for swine].—Rape pasture did not furnish sufficient protein to balance the ration when different grains were fed to lots of pigs grazing it. White and yellow sweet clover, alfalfa, and Sudan grass furnished a palatable forage for pigs, but grain must be included in the ration for best results.

How can soy beans be fed to prevent soft pork?—When soy beans make up 25 per cent of the ration, the resulting meat is of poor quality. Ground soy beans and ground corn did not produce as good finish on pigs as corn and tankage, but ground corn alone gave the poorest finish of all.

Winter feeding fall pigs.—The results of this test (E. S. R., 56, p. 668) showed that pigs full fed on corn or barley during the winter months made practically the same gain, but the barley-fed pigs required more grain and less protein supplement to produce 100 lbs. of gain. Slaughter tests gave little evidence of differences in the quality of lean and fat produced on these rations.

A ration of ground barley, tankage, and linseed oil meal plus alfalfa hay ad libitum produced larger and more economical gains than did rations of ground barley and tankage plus alfalfa hay or ground barley and ground oats plus alfalfa hay.

Feeding cocoa meal to hogs, R. D. APLIN (Vermont Sta. Bul. 271 (1927), pp. 10, fig. 1).—Two lots of 4 sows each were similarly fed from breeding to farrowing on grass pasture, except that in one lot 15 per cent of cocoa meal was substituted for 9 per cent of corn meal, 4 per cent of tankage, and 2 per cent of linseed oil meal. In outward appearance the sows were practically the same during the test except that the hair coat in the cocoa meal lot was somewhat rougher than in the check lot. Two sows in the check lot aborted 2 weeks before farrowing, due to injuries. The remaining sows in this lot farrowed 16 normal, vigorous pigs, and 1 runt. The 4 sows in the cocoa meal lot farrowed 34 pigs. Only 9 of these pigs were of normal size, and all were very weak, especially in the legs. Eight pigs were born dead. Of these born alive only 2 lived to more than 3 weeks of age, and these 2 were undersized and unthrifty.

Two sows from the cocoa meal lot were placed in dry lot and continued on the same ration to be fattened. One sow from the check lot and 1 from the cocoa meal lot were fed as a check. The feeding period lasted 77 days. During this time the check lot gained 186 lbs. and the cocoa lot 92 lbs. The ration containing cocoa meal was not palatable, and 1 sow ate so little that she failed to gain appreciably. The check lot consumed 6.9 lbs. of feed per pound of gain, while the cocoa lot ate 11.5 lbs. for the same gain. The check lot and the best sow from the cocoa lot were slaughtered, but no significant difference was found in the dressing percentage or in the meat, except that the check lot carried more fat. Cooking tests of chops failed to show any difference in taste.

Two lots of eight 10-week-old pigs each were fed rations similar to those above, except that they contained more protein supplement. Difficulty was

experienced in getting pigs to eat enough of the cocoa meal ration to make normal gains, and scours and general unthriftiness were common to this lot. During a 22-day period the check lot gained 86.5 lbs. and consumed 4.3 lbs. of feed per unit of gain, while the cocoa lot gained but 10.5 lbs. and ate 23.2 lbs. of feed for the same gain.

Theobromine and caffeine, both alkaloids and stimulants, are deemed by the author to be the cause of the unfavorable results obtained with cocoa meal.

[Experiments with poultry at the South Dakota Station] (*South Dakota Sta. Rpt. 1927*, pp. 28-30).—The results of several experiments are reported.

Artificial lighting.—The results of tests with artificial illumination are practically the same as those previously noted (*E. S. R.*, 56, p. 567). Pullets with lights from December 15 to May 1 gave 48 per cent egg production as compared with 38 per cent egg production for pullets in unlighted lots. A pen having lights and some artificial heat during extremely cold weather had a 54 per cent egg production for the period. The unlighted pens caught up in production with the lighted pens by the end of June.

All-mash ration for layers.—Two lots of 55 Leghorn pullets were fed the same ration except that 1 lot received it as all mash and the other as scratch and mash. The all-mash group laid fewer eggs, consumed more feed, and gained more in body weight than those on mash and scratch. A lot of 142 chicks on an all-mash ration gained the first week 107 per cent, the second week 67 per cent, the third week 55 per cent, and the fourth week 40 per cent. There was a mortality of 8 chicks for the four weeks' period.

Comparison of high protein feeds.—Pens of 30 birds each were fed the same basal ration with the following protein supplements: Buttermilk powder, tankage, ground soy beans, soy bean meal, meat scrap, and cottonseed meal. The cost per dozen eggs produced from lowest to highest was in the order given. Mortality was lowest in the ground soy bean and milk powder lots, and highest in the soy bean meal and cottonseed meal lots.

Alfalfa for poultry.—Ground alfalfa as a portion of the basal ration gave a lower feed cost per dozen eggs than either bran or middlings. The optimum percentage for alfalfa in the ration appears to be between 10 and 20 per cent, and at 40 per cent production could not be maintained satisfactorily.

Turning hatching eggs.—Turning eggs up to the fifteenth day improved hatches, but eggs not turned after that date gave better results than those turned to the nineteenth day.

Minerals for poultry.—Ground limestone, ground phosphate rock, iron sulfate, flowers of sulfur, charcoal dust, Epsom salts, and iodized sodium chloride were fed in separate compartments of a feeder, with middlings as a carrier. Hens ate all mixtures about equally, showing a slight preference for sulfur and iron sulfate.

Influence of time of hatch on hatchability of the eggs, rate of growth of the chicks, and characteristics of the adult females. C. W. UPP and R. B. THOMPSON (*Oklahoma Sta. Circ. 67 (1927)*, pp. 8, fig. 1).—A popular edition of Bulletin 167, previously noted (*E. S. R.*, 58, p. 468).

Incubation and brooding of chickens. M. A. JULL and A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 1538 (1928)*, pp. 11+28, figs. 13).—This is a revision of and supersedes Farmers' Bulletins 1363 and 1376, previously noted (*E. S. R.*, 50, pp. 174, 780).

Intensity or rate of laying in relation to fecundity. F. A. HAYS and R. SANBORN (*Massachusetts Sta. Tech. Bul. 11 (1927)*, pp. 179-194).—In continuing this series of studies (*E. S. R.*, 56, p. 270), four measurements of intensity have been studied in relation to fecundity. These measures were first 60-day

egg record, mean size of winter egg clutch, net winter rate, and annual rate of the Rhode Island Red flock at the station.

The positive correlation between first 60-day egg record and subsequent winter record was $+0.3445 \pm 0.01$. Net winter rate showed a coefficient of correlation of $+0.4769 \pm 0.0104$ with annual egg record compared with a coefficient of $+0.3544 \pm 0.0117$ between winter clutch size and annual record. For the population studied the annual rate had a constant of correlation with the annual egg record of $+0.7106 \pm 0.0066$.

From the breeder's standpoint the mean size of winter clutch is the best index of intensity, since it can be accurately determined and is inherited. While the number of eggs laid during the first 60 days is correlated with annual production, the degree is small. The size of winter clutch and the annual rate of laying are not affected by the date of hatching. Factors determining early maturity are linked with factors for large clutch size. Body weight at the time the first egg is laid is negatively correlated to a moderate degree with mean winter clutch. Age at first egg shows negative correlation with annual rate, as does also body weight at first egg with annual rate. The age at first egg and degree of broodiness are independent. The positive correlation between total broody days and mean winter clutch indicates a tendency of broody birds to lay larger winter clutches than nonbroody birds.

The fur rabbits, J. J. DYNOWSKI (*Les Lapins à Fourrures*. Paris: J. B. Baillière & Sons, 1927, pp. VII+136, pls. 2, figs. 16).—A popular treatise for the practical breeder of fur rabbits, describing the various breeds and discussing breeding, housing, feeding, sanitation and disease, castration, killing, and the preservation of the pelt.

DAIRY FARMING—DAIRYING

Growth and development, with special reference to domestic animals.—VIII, The relation between weight growth and linear growth with special reference to dairy cattle, S. BRODY (*Missouri Sta. Research Bul. 103* (1927), pp. 40, figs. 14).—In this study of weight growth in relation to linear growth, continuing the series previously noted (E. S. R., 58, p. 460), the author has determined that as the time rate of tridimensional growth increases at a constant percentage rate, the time rate of linear growth remains approximately constant. When, however, the time rates of tridimensional growth decline at a constant percentage rate, the time rates of linear growth decline at a constant but higher percentage rate. On this basis the age curves of both linear and tridimensional growth may be divided into two segments, one an increasing and the other a decreasing segment, the junction being reached in both cases approximately at puberty. The charts presented are based on data summarized in Research Bulletin 96, noted on page 762.

Of the 21 linear measurements of dairy cattle studied, the width of forehead approached mature value most rapidly, followed in order by length, and height at hips, croup, and withers. Those that approached mature value the slowest were width of hips and circumference of chest and paunch. Weight increases, roughly, as a power of the linear measurements, the value of this power ranging from 2 to 5 depending on the rapidity with which the linear measurement approaches mature value.

Undernutrition exerts the greatest influence on the linear measurements that approach mature value slowest. Such nutrition also has more effect upon the measurements that include fleshy growth in contrast to those that are strictly of the skeleton.

Growth and development, with special reference to domestic animals.—X, The relation between the course of growth and the course of senescence with special reference to age changes in milk secretion, S. BRODY (*Missouri Sta. Research Bul. 105 (1927)*, pp. 64, figs. 27).—Continuing the series noted, the age changes in milk yield were found to follow the same course as the age changes in body weight. The milk yield begins to decline some time after the maximum body weight is reached, but there is no symmetry about the maximum of age curve of milk yield. The time curve of milk secretion with the advance of the period of lactation is made up of an increasing and a decreasing segment of time rate of milk yield. Additional data on man and fowls have been introduced to substantiate the conclusion that the time rate of senescence increases exponentially with increasing age.

Appended are discussions of the limiting values for milk and egg production, the relation between total, maximum, and rate of decline in milk production during lactation, equivalence charts between growth in weight and age changes in milk production, the relation between milk and fat yield and fat percentage, and historical notes relating to the mechanism of milk secretion.

Growth and senescence in purebred Jersey cows, F. A. DAVIDSON (*Illinois Sta. Bul. 302 (1928)*, pp. 181–235, figs. 18).—A study of the Register of Merit records of 9,694 original entry and 2,628 reentry cows of the Jersey breed was made to determine the course of growth and senescence.

The increase in body weight with advancing age was estimated by the growth equation

$$\log_{10} W = A - be^{-kt}$$

in which W is the weight at any age t , and A is the logarithm of the body weight at maturity, $100k$ is the constant percentage rate of decrease in growth power per unit weight, e is the base of natural logarithms, and b is a constant locating the curve in point of time. The reentry cows reached a greater weight at maturity and increased in weight more rapidly than original entry cows, although both reached their maximum weight at approximately 8 years of age. The author assumes that the advantage of the reentry cows is due to their more favorable care and management.

It was found that the formula

$$y = \frac{1}{sx\sqrt{2\pi}} e^{-\frac{1}{2} \left[\frac{\log x - a}{s} \right]^2}$$

was best adapted to the yearly fat yield frequency distributions of both original entry and reentry cows, in which a and s are the mean and standard deviation, respectively, on the log scale. The percentage of cows eliminated by the production requirement, as estimated by the fitted frequency curve, is 2 to 4 per cent of the reentry cows and from 10 to 39 per cent of the original entry cows.

The yearly fat yields increase with age at an ever-decreasing rate until a maximum is reached, and then decline at an ever-increasing rate. The fat yields of the reentry cows are much greater than the fat yields of the original entry cows, increasing at a greater rate with age, and after the peak is reached decreasing less rapidly than the fat yields of the original entry cows. The age at which maximum production is reached is 8 years 9.22 months for the reentry cows and 7 years 4.42 months for the original entry cows.

Raising the dairy heifer, J. B. SHEPHERD (*U. S. Dept. Agr. Leaflet 14 (1927)*, pp. 5, figs. 5).—Popular directions are given for feeding, housing, breeding, and handling the dairy heifer.

[Experiments with dairy cattle at the South Dakota Station] (*South Dakota Sta. Rpt. 1927, pp. 11, 12, 13*).—The results of several experiments are reported.

Effect of sunlight on growth of calves.—Calves having access to direct sunlight developed heavier bones, weighed more, and were in better physical condition than calves not having access to sunlight (*E. S. R., 56, p. 671*). Some of these latter calves became humpbacked, while others developed bowed legs, enlarged joints, and other abnormal conditions.

Alfalfa v. sweet clover for pasture.—Preliminary work has indicated no difference in the carrying capacity of sweet clover and alfalfa pasture, and the rate of decline in milk production has been approximately the same with both crops. No difficulty was experienced in getting cows to eat sweet clover, nor was any indication of bloat observed.

Apparent digestibility as affected by length of trial and by certain variations in the ration. B. H. SCHNEIDER and H. B. ELLENBERGER (*Vermont Sta. Bul. 270 (1927), pp. 48*).—In this study 505 daily weights of feces for trials with milking cows and 168 for maintenance trials from records of digestion trials at the station form the basis for the data reported. Six factors as well as a comparison of the observed and calculated digestible nutrients in complex rations were studied.

It was found that variations may occur in any one or in more than one factor, making it impossible to calculate accurately the digestibility of nutrients from the average coefficients. The individuality of the animal and differences in composition of the same feed in different lots also causes irregularities.

Based upon the results of this study the authors deem it inadvisable to conduct digestion trials with milking cows for less than 8 days or for less than 20 days in maintenance trials where the quantity of feces voided is small. This is especially true in feeding trials in which close comparisons are to be made of the digestible nutrients.

Soybeans and soybean hay in the dairy ration. O. G. SCHAEFER (*Minnesota Sta. Bul. 239 (1927), pp. 16*).—In part 1 of this bulletin the results of two trials with ground soy beans as a protein supplement for dairy cattle are reported. Two groups of 11 cows each were fed for three 24-day experimental periods separated by 6-day transitional periods in the first test and for two 30-day experimental periods preceded by a 10-day transitional period in the second test. The feeding was planned to furnish sufficient nutrients for production without any excess for body fat, and the ration was the same in both groups except that one lot received linseed oil meal and the other ground soy beans. The average production per 100 lbs. of total digestible nutrients while on linseed oil meal was 149.7 lbs of milk and 5.75 lbs. of butterfat. The corresponding figures for the ground soy bean lot were 145.7 lbs. of milk and 5.86 lbs. of butterfat. The average fat test for the ground soy bean group was 4.01 per cent and for the linseed oil meal group 3.82 per cent.

Three trials using the double reversal method, each trial consisting of three 30-day experimental periods preceded by 10-day transitional periods, are reported in the second part on the feeding of soy bean hay as compared with timothy hay. The rations fed were identical with the exception of the hays, which were fed in such amounts as the cows would completely clean up. Using lots of 16 cows each, the consumption of soy bean hay was 34 per cent greater than that of timothy hay. On the basis of 100 lbs. of digestible crude protein fed the cows in the soy bean hay group produced 1,005 lbs. of milk and 37.1 lbs. of butterfat, while the timothy hay group produced 1,015 lbs. of milk and 37 lbs. of butterfat. The soy bean hay group, on the basis of 100 lbs. of total digestible nutrients fed, produced 134.4 lbs. of milk and 5 lbs. of

butterfat as compared with 138.7 lbs. of milk and 5.1 lbs. of butterfat in the timothy hay group. Soy bean hay effected a saving of 46 per cent in the concentrates fed and reduced the expenditure for mill feeds 93.6 per cent. When timothy hay was fed, 53 per cent of the concentrates had to be purchased, as compared with 5 per cent when soy bean hay was fed.

Effect of feeding cocoa meal to milking cows, R. D. APLIN and H. B. ELLENBERGER (*Vermont Sta. Bul.* 272 (1927), pp. 20, figs. 5).—Continuing the study previously noted (*E. S. R.*, 56, p. 568), 20 cows were fed the same basal ration for 2 weeks, and their normal yield and fat test were determined. They were then divided into 5 similar groups and fed the following rations for 7 days: Lot 1 basal ration, lot 2 cocoa meal substituted for 20 per cent of the basal grain ration, lot 3, 4 per cent of cocoa fat replaced by weight 8 per cent of the grain ration, lot 4, 0.4 per cent of theobromine added to the basal ration, and lot 5, 0.15 per cent of caffeine added to the basal ration. After 7 days of such feeding the cows were shifted to the basal ration, and observations were made of the time required to return to normal. The trial was again repeated, and the rations of the groups shifted so that a different ration was fed during the second trial.

The data reveal that cocoa meal reduced the milk yield 11 per cent and increased the fat test 20 per cent and the butterfat production 6 per cent. When fed cocoa fat the yield was not affected, but the fat test and butterfat production were increased 5 and 4 per cent, respectively. Theobromine feeding decreased the milk yield 8 per cent, increased the fat test 8 per cent, and decreased the butterfat production 1 per cent. The feeding of caffeine was without any significant effect. The response to feeding cocoa meal and theobromine was immediate, both at the beginning and at the end of the test, while the response to cocoa fat was more gradual. No difference in the flavor of the milk or butter was found that could be attributed to cocoa meal, but butter made from cream obtained during the cocoa meal feeding had a firmer body and the melting point of the butterfat was higher.

Thermophilic and thermoduric microorganisms, with special reference to species isolated from milk.—I, Review of literature, A. H. ROBERTSON (*New York State Sta. Tech. Bul.* 130 (1927), pp. 56).—In this bulletin, the first of a series issued in cooperation with the Vermont Experiment Station, the author reviews the literature of thermophilic and thermoduric microorganisms, especially of the species isolated from milk. While spore-forming organisms are widely distributed, only one nonspore-forming thermophile has been described.

Thermophilic and thermoduric microorganisms, with special reference to species isolated from milk.—II, The thermal resistance of microorganisms, A. H. ROBERTSON (*Vermont Sta. Bul.* 274 (1927), pp. 27).—The literature on the causes of thermal resistance is reviewed by the author. Data show that cells subjected to desiccation survive longer when encapsulated than when not encapsulated, the capsule retarding the loss of moisture. Sarcinae survived higher temperatures than micrococci and nonspore-forming rods, with the exception of *Microbacterium lacticum* and *Laetobacillus thermophilus*. Hypotonic solutions decreased the heat resistance of the cells, while hypertonic solutions increased the resistance up to and including 50 per cent sucrose. Certain microorganisms when gradually subjected to increasing temperatures are able to acclimatize themselves and develop a higher thermal resistance.

Thermophilic and thermoduric microorganisms, with special reference to species isolated from milk.—III, Description of the non-spore-forming, thermoduric organisms isolated, A. H. ROBERTSON (*New York State Sta. Tech. Bul.* 131 (1927), pp. 62).—"Pin-point" flora from pasteurized milk and nonspore-forming cultures from milk pasteurized for several hours, from milking ma-

chines improperly sterilized, and from milk accidentally contaminated were obtained from different sources for study. Cultures in which 90 per cent of the cells survived pasteurization in the order of their resistance were *Microbacterium lacticum*, *Sarcina lutea*, *Streptococcus thermophilus*, *Sarcina rosea*, and *Micrococcus conglomeratus*. Of these, *M. lacticum* and *S. thermophilus* may form "pin-point" colonies, but the presence of none of these cultures in milk is considered dangerous.

Thermophilic and thermoduric microorganisms, with special reference to species isolated from milk.—IV, Effect of age of culture on the heat resistance of non-sporeforming bacteria, A. H. ROBERTSON (*Vermont Sta. Bul.* 275 (1927), pp. 27, figs. 19).—Milk cultures of *Microbacterium lacticum*, *Sarcina lutea*, and *Streptococcus thermophilus* were pasteurized for 30 minutes, usually at 62.8° C. (145° F.). Other samples of the original culture were pasteurized immediately after inoculation with these cultures and at later periods, as desired. Plate counts were made before and after pasteurizing to determine the number of bacteria killed.

The young, rapidly growing cells were more susceptible to high temperatures than the older cells. The degree of killing at any one age is greater and extends over a longer period of time as the heat used approaches the thermal death point of the organism. The author concludes that the most efficient pasteurization of milk or canning of food is obtained if the heat is applied while the microorganisms are in the growing stage.

Standardization of ice-cream mixes, P. H. TRACY (*Illinois Sta. Circ.* 323 (1928), pp. 36).—The author illustrates various methods of standardizing ice cream mixes and presents useful information on the composition of milk products.

VETERINARY MEDICINE

Common diseases of farm animals, R. A. CRAIG (*Philadelphia and London J. B. Lippincott Co.*, 1927, 4. ed., rev., pp. XII+332, pl. 1, figs. 117).—This is a revised edition of the work previously noted (E. S. R., 40, p. 778).

Report on the Civil Veterinary Department, Burma (including the Insein Veterinary School), for the year ended the 31st March, 1927, A. McKERRAL (*Burma Civ. Vet. Dept. Rpt.* 1927, pp. [5]+3+25, pl. 1).—This is the usual annual report (E. S. R., 56, p. 876), which includes an account of control work with infectious diseases of livestock. Statistical data on contagious diseases of livestock, results of protective inoculation, etc., are appended.

Food infections and food intoxications, S. R. DAMON (*Baltimore: Williams & Wilkins Co.*, 1928, pp. VIII+266, pls. [18], figs. [13]).—The first part of this work (pp. 1-63) deals with infections from food, including paratyphoid infections, tuberculosis from milk and meat, undulant fever from milk, septic sore throat from milk, and actinomycosis; part 2 (pp. 65-164) deals with intoxications from food, including botulism, mushroom poisoning, grain intoxications, milk sickness, potato poisoning, and fish and shellfish poisoning; and part 3 (pp. 165-200) deals with zoo-parasitic infections acquired through food, including human infection with animal parasites, trichinosis, taeniasis, other parasites of man acquired through food, and diagnosis of helminth infestation.

The diagnosis of infectious and parasitic diseases by complement fixation, A. URBAIN (*La Réaction de Fixation Appliquée au Diagnostic de Certaines Maladies Microbiennes ou Parasitaires Communes à l'Homme et aux Animaux. Paris: Rev. Path. Compar. et Hyg. Gén.*, 1927, pp. 276).—This work describes the complement fixation test, the manner of conducting it, and its application to the

detection of diseases of both man and the lower animals. Included in the list of diseases of livestock considered are strangles, anthrax, infectious abortion, undulant fever, coccidiosis, etc. References to the literature accompany many of the chapters.

Serological studies on hydatid, I. HILES (*Jour. Helminthol.*, 4 (1926), No. 4-5, pp. 143-178).—The author has found that alcoholic extracts of scolices are more potent antigens than the hydatid fluids usually obtainable in England. Extracts prepared from dried scolices with absolute alcohol are the most potent. The treatment of the scolices with acetone previous to the extraction with alcohol was found to lessen only slightly the antigenic power of the extract. The presence of saline in the alcohol for extraction lessens the potency of the extract. Considering these points, the antigenic factor seems to be alcohol-soluble rather than acetone- or saline-soluble, and to be mainly lipoidal in nature.

The possible interference of alcohol in the reaction was avoided by making the extracts of a sufficiently high concentration to require considerable dilution with saline before use. These concentrated extracts in the same way lessened the danger of pseudopositive reactions with syphilitic sera. The slow emulsification of the extract with the diluting saline was of advantage, giving a rather stronger reaction than when the emulsion was rapidly made. The addition of cholesterol within the limits of 1 part of cholesterol to 1.5 to 6 parts of extract was also of distinct advantage in enhancing the reaction.

Observations on *Leptospira icterohaemorrhagiae* in the wild rats of Baltimore, E. W. WALCH and G. B. WALCH-SORGDRAGER (*Amer. Jour. Hyg.*, 7 (1927), No. 4, pp. 393-406, pl. 1).—In the course of the studies here reported the authors found that 33 per cent of 51 rats captured in Baltimore from November, 1924, to January, 1925, harbored *L. icterohaemorrhagiae*, and that 12 per cent were carriers of virulent strains.

The Shaw-Mackenzie blood-test in cancer and its significance, A. WILSON (*Jour. Trop. Med. and Hyg.* [London], 30 (1927), No. 23, pp. 312).—Attention is called to the conclusion of J. A. Shaw-Mackenzie in 1920 that carcinoma serum is deficient in its power to activate fat splitting as compared with normal serum, and further that the power of goat serum to activate fat splitting is high. Reference is made to the treatment by sodium oleate injections and the striking effect obtained in certain cases.

Preliminary note on the experimental study of enzootic encephalomyelitis (Borna disease), S. NICOLAU and I. A. GALLOWAY (*Brit. Jour. Expt. Path.*, 8 (1927), No. 4, pp. 336-341, pls. 3).—In this preliminary note the results are given of experiments undertaken with a strain of virus isolated by Zwick and his collaborators (E. S. R., 52, p. 584; 56, p. 873) from horses and with another isolated by H. Miessner⁴ from sheep. The two strains were found to be identical as demonstrated by cross-immunity experiments and the infection of more than 200 rabbits.

The mouse was found to be more resistant to infection than the guinea pig and the rat, while the ferret appeared to be refractory to intracerebral inoculation with the virus. In the rabbit, inoculation of the virus of Borna disease intracerebrally produces lesions of a typical encephalo-myelitis, to which are added profound changes of the spinal ganglia and peripheral nerves (encephalo-myelitis, ganglio-radiculitis, and a peripheral neuritis). In the central nervous system as well as the spinal ganglia histological modifications are of two orders, infiltrative and degenerative.

⁴ *Deut. Tierärztl. Wchnschr.*, 34 (1926), No. 26, pp. 687-689, figs. 4.

A durable immunity can be conferred upon rabbits by intracerebral inoculation of a suitably attenuated virus. According to the authors such immunity may last at least 160 days. The strain of encephalo-myelitis virus isolated from the horse infected with Borna (Zwick strain) suitably attenuated renders rabbits resistant to the intracerebral inoculation with the virus isolated from the brain of sheep (Miessner strain). Rabbits hyperimmunized against herpes by intracerebral inoculation are still susceptible to infection with the virus of Borna introduced by the same route.

The relationships between heat-stable agglutinogens and sensitivity to bacteriophage in the Salmonella group, F. M. BURNET (*Brit. Jour. Expt. Path.*, 8 (1927), No. 2, pp. 121-129).—The author concludes after a consideration of their sensitivity to a series of bacteriophage types that the three Salmonella species *Bacillus enteritidis*, *B. typhosus*, and *Bacterium pullorum*, which have practically identical heat-stable agglutinogens, form a homogeneous group. According to the strain chosen, one to three types of reaction toward bacteriophage may take place, each type being common to the three species, except that in the case of *B. pullorum* one type has not yet been demonstrated.

Immunity in foot and mouth disease, I, II, F. C. MINETT (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 3, pp. 173-195).—This is a more detailed account of the results obtained in immunity work with foot-and-mouth disease conducted for the Foot-and-Mouth Disease Research Committee than that which appeared in the appendix of the second progress report, previously noted (*E. S. R.*, 57, p. 77).

Part 1 of this account (pp. 175-188) deals with the standardization of immune serum, and part 2 (pp. 188-194) with the nature of the immunity in foot-and-mouth disease.

A list is given of 31 references to the literature.

The treatment of John's disease by the intravenous injection of formalin, A. L. SHEATHER (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 3, pp. 224-229, figs. 2).—The results obtained in the four cases here reported fail to support the view that animals affected with John's disease can be cured by formalin administered intravenously.

Trypanblue and certain dithio-aniline derivatives: Some clinical observations upon their efficacy in the treatment of piroplasmosis and other affections in the Central Provinces, India, R. F. STIRLING (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 4, pp. 274-281).—Reporting upon work with trypanblue, it is stated that its value in the treatment of acute and chronic types of piroplasmosis has been shown in practice in the Central Provinces, India. Also in numerous cases of chronic debility, slowly healing wounds, and other local manifestations of a probable systematic disturbance the administration of the drug may be followed by rapid clinical improvement whether piroplasms are readily demonstrated by microscopic examination in the peripheral blood or not. Used in cases of foot-and-mouth disease, it was found that when administered during an early stage, while the animal was exhibiting an acute febrile reaction to infection, rapid improvement took place, and the length of time that elapsed between the first appearance of symptoms and eventual complete resolution was reduced by 50 per cent in the treated animals. It was found to have no prophylactic action.

A report is also made upon the effect of intramine, a dithio-aniline preparation. This dye appeared to exert no appreciable inhibitory effect upon trypanosomes. Piroplasms disappeared from the blood stream within 24 hours after the administration of the drug. Used against foot-and-mouth disease in a herd it cut short the course of the disease in an even more striking degree than did the trypanblue.

Filtrable forms of the stranglers *Streptococcus* [trans. title], A. URBAIN (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 35, pp. 1598-1600).—The author's studies indicate that *S. equi* may occur in a filtrable form resembling the forms recently discovered in the streptococci affecting man.

A note on the experimental transmission of theileriosis (Egyptian fever), S. J. GILBERT (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 4, pp. 293-398).—The author finds that the sickness due to *Theileria* in Palestine may be divided into acute, subacute, and chronic types.

Excretion of avian tubercle bacilli in the milk of goats after subcutaneous inoculation, A. S. GRIFFITH (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 4, pp. 290-293).—The author reports upon the subcutaneous inoculation of two goats with avian tubercle bacilli, followed by subsequent periodical testing of the mammary secretion.

Bovine lymphangitis, or tropical actinomycosis, R. DAUBNEY (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 3, pp. 195-216, figs. 8).—The author reports upon four cases of bovine lymphangitis, with three of which it was possible to demonstrate acid-fast *Actinomyces* in smears of pus from the lesions. This organism, which is identical with *A. farcinicus* discovered by Nocard in 1888, has also been obtained in pure culture from the lesions. A typical case of the disease was produced in one of two cattle inoculated with cultures of the organism. Lesions similar to those described by Nocard were also produced by the inoculation of guinea pigs with living cultures.

Contagious bovine pleuro-pneumonia immunisation, R. H. KNOWLES (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 3, pp. 230-241).—The author finds that the virus of contagious bovine pleuropneumonia can be cultivated in plain broth containing 2 per cent of peptone and 10 per cent of horse serum, and that this medium is suitable for growing the culture virus for the preparation of vaccines.

A culture of the virus which has been attenuated constitutes a reliable vaccine against the disease. A single dose of 2 cc. of culture virus given subcutaneously confers a strong immunity against subsequent injection of virulent lymph. There appears to be no relation between the virulency and the antigenic properties of the culture virus. Completely avirulent strains of culture virus confer a strong immunity without causing any thermal or local reactions. Individual strains of culture virus vary in their antigenic properties. For vaccine production these are selected by vaccination of cattle, and later by testing these vaccinated cattle with virulent lymph. The culture virus can be subcultured over considerable periods without loss of its antigenic properties. The sixty-sixth generation of one strain conferred a strong immunity.

Variation shown by *Bacillus oedematiens* isolated from a bovine animal, A. D. McEWEN (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 4, pp. 281-289).—*B. oedematiens* was found by the author to be the causative organism in a clinical case of quarter evil in a bovine 33 months of age. It was recovered both by direct cultivation and guinea pig passage. Variations were observed in the strain isolated by cultivation, which were studied and are here discussed.

Braxy in sheep: Field tests of vaccine in 1925-26, T. DALLING, J. H. MASON, and H. R. ALLEN (*Vet. Jour.*, 82 (1926), No. 614, pp. 406-410).—It is reported that in two braxy districts in Northumberland, England, the use of a vaccine consisting of a mixture of underneutralized vibrion septique toxin-antitoxin and *Bacillus chauvoei* filtrate reduced the mortality in lambs from 6.8 per cent among 1,457 unvaccinated to 2.2 per cent among 4,010 vaccinated. The pig-dung treatment under controlled conditions in one district apparently had no beneficial effect in preventing braxy.

Prophylaxis of lamb dysentery, T. DALLING, J. H. MASON, and W. S. GORDON (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 3, pp. 217-223).—Vaccines made from a type of *Bacillus welchii* and from strains of *B. coli* isolated from lambs affected with lamb dysentery were used to immunize ewes in Scotland, Northumberland, and Wales with a view to protecting their lambs against lamb dysentery. Two inoculations, one in autumn and one in spring, were made. Among 4,046 lambs born from inoculated ewes the mortality was 0.87 per cent, while of 2,152 lambs from control ewes 8.04 per cent died.

Serum made from types of *B. welchii* was used on young lambs with the result that from 1,122 lambs injected 5 died from lamb dysentery, while of 1,241 untreated lambs 213 died. The results obtained are considered to indicate that *B. coli* plays but little or no part in the protection of lambs.

On the parasitic development of *Monodontus trigonocephalus*, the sheep hookworm, T. W. M. CAMERON (*Jour. Helminthol.*, 5 (1927), No. 3, pp. 149-162, figs. 13).—This report of studies includes a list of 11 references to the literature.

Employment of electrargol in the pneumocenterites of swine, A. PERREAU (*Emploi de l'Electrargol dans les Pneumo-Entérites Porcines*, Thesis, École Natl. Vét. Lyon, 1927, pp. 59).—The author's studies have led to the conclusion that the subcutaneous injection of electrargol is the treatment to be preferred in affections of this nature, it having the advantage of being innocuous, readily procurable in large quantities, and possessing very satisfactory therapeutic qualities.

A six-page list of references to the literature is included.

The anatomy of *Oesophagostomum dentatum* (Rud.), a nematode parasite of the pig, with observations on the structure and biology of the free-living larvae, T. GOODEY (*Jour. Helminthol.*, 2 (1924), No. 1, pp. 1-14, figs. 15).—This paper adds certain details to the knowledge of the anatomy of the adult worms, with drawings of the principal regions in both sexes, and gives an account of the first and second larval stages, together with some observations on the biology of the ensheathed larvae.

Some stages in the development of *Oesophagostomum dentatum* from the pig, T. GOODEY (*Jour. Helminthol.*, 4 (1926), No. 4-5, pp. 190-198, figs. 3).—This is a continuation of the study above noted, in which the author adds to the knowledge of the life history of this parasite.

Immunity or resistance of the chicken to coccidial infection, W. T. JOHNSON (*Oregon Sta. Bul.* 230 (1927), pp. 31).—In this work the author reports upon experiments with 346 commercial cage-reared fowls, the details of which are given in tabular form:

Some of the commercially reared mature fowls were found quite susceptible to coccidial infection, but the majority showed marked resistance if not immunity. A high degree of resistance to coccidial infection was regularly produced experimentally in both developing and mature cage-reared fowls. An equal degree of susceptibility was, almost without exception, maintained when desired by proper management.

Suspensions were used which regularly produced predominant cecal infection and other suspensions which regularly produced small-intestine infection. "No reciprocal relationship between small-intestine and cecal infection was indicated. One or more inoculations did not necessarily produce a clinically observable resistance to a later inoculation. Resistance to coccidial infection was dependent upon the degree of infection, as well as predilection of the parasite. A high degree of resistance to cecal infection was produced in very susceptible fowls within 15 days from the time of previous inoculation. Infection of the ceca and small intestine was simultaneously produced. Daily inoculations

with 2,000 or less sporulated oocysts resulted in resistance with less manifestation of disease than when larger numbers were given at greater intervals. There was no apparent difference in predilection of the parasite of a given suspension regardless of whether given to fowls of brooder age or older. Two fowls were highly resistant at least 6.5 months after the final inoculation."

Reference is made to the work of Tyzzer (E. S. R., 57, p. 381), who has found that the acute coccidiosis of chickens, marked by extensive and often fatal hemorrhage into the ceca and lower intestinal tract, should be known as *Eimeria tenella*, while the form developing superficially in the epithelium of the small intestine, which produces only small schizonts and merozoites and is nonpathogenic, should be known as *E. avium*.

Fowl pox, T. M. DOYLE and F. C. MINETT (*Jour. Compar. Path. and Ther.*, 40 (1927), No. 4, pp. 247-266, figs. 4).—In this contribution from the Veterinary Laboratory of the British Ministry of Agriculture the author concludes that both comb and mouth lesions are due to the same virus, since they confer immunity against each other. The disease should always be known as fowl pox. No evidence has been found that bacteria alone produce typical false membranes, although it is considered possible that bacteria may play an important secondary part. The fowl pox virus may be associated with roup, but the use of the term "roup" should be restricted to the condition characterized by catarrhal inflammation of the conjunctiva and upper air passages when this is unaccompanied by lesions of fowl pox in any bird of the flock.

Strains of fowl pox virus were obtained from 12 separate outbreaks, and cross-immunity tests showed them to be immunologically indistinguishable. Pigeons could be successfully infected with fowl pox virus by frequent passage on the skin of the leg. The viruses of fowl pox and pigeon pox were immunologically indistinguishable. Cowpox virus was found to produce characteristic lesions in the fowl's comb, but frequent passage of cowpox virus through fowls failed to change the character of the lesions or to bring about a resemblance to the lesions of fowl pox.

It was found that direct contact between diseased and healthy birds is necessary for the spread of the disease, and that the virus does not pass through unbroken skin. In the experiments conducted, no evidence was found of the existence of disease carriers. The authors were unable to demonstrate the persistence of the virus in the internal organs of recovered birds or on the comb after complete disappearance of lesions.

The account concludes with a list of 35 references to the literature.

Studies in the etiology of roup and allied diseases of fowls, E. P. JOHNSON (*Michigan Sta. Tech. Bul.* 85 [1927], pp. 20, figs. 6).—The first part of this report of studies consists of a review of the literature in connection with a list of 21 references. It is followed by an account of the symptoms, course, and gross lesions observed in the different forms of the disease. An account of experimental work with organisms in the eyes and throat of affected birds follows.

Cultures obtained by swabbing the eyes and throats of 12 fowls having both eye and throat lesions resulted in finding a bipolar organism resembling *Pasteurella avicola* in seven of the fowls. In the remaining five, organisms resembling *Bacillus coli* and *Pseudomonas pyocyanea* were found. Cultures made by swabbing the throats of seven normal birds failed to show the presence of the *Pasteurella* organism. Neither was the *Pasteurella* organism found in cultures made from throats of 11 birds showing lesions of pox on comb and wattles.

This organism was found to be closely related to, if not identical with, *P. avicola* in a high percentage of birds with lesions of avian diphtheria and

ocular roup, but its pathogenicity was never significant when inoculated into susceptible birds, and the author concludes that it is of secondary importance.

The filtrate obtained from lesions of avian diphtheria and ocular roup was capable of reproducing lesions in a very high percentage of cases. In only one case, however, was filtrate from these lesions found to bring on lesions of chicken pox on comb, while pox lesions can be reproduced at will by using the virus from pox lesions as inoculum. This would suggest that two or more viruses play a part in these conditions. Cell inclusions were demonstrated in lesions of fowl pox on comb, but not in diphtheritic lesions of larynx and trachea.

The work has led to the conclusion "that roup, in its broadest sense, is caused by filtrable viruses either acting in definite combinations to bring on the various forms, or by different viruses acting singly to produce the different forms of the disease. The different organisms that are frequently found associated with the various forms must be considered of secondary importance so far as the actual etiology is concerned, but these organisms may have considerable to do with the severity of the disease and the course of an outbreak."

A study of the pathogenic and antigenic properties of *Eberthella gallinara* (Klein)—*E. sanguinaria* (Moore), C. C. PALMER and H. R. BAKER (*Delaware Sta. Bul.* 153 (1928), pp. 14).—The cultures isolated in Delaware outbreaks of fowl typhoid in which there was a high mortality occasionally failed to kill birds, and it was found that most strains of the fowl typhoid organism not only possess a low virulence for fowls, but the virulence is soon lost when the organism is maintained upon artificial media. From six natural outbreaks of fowl typhoid in flocks on Delaware farms, ranging from 25 to 150 mature birds, in which the mortality ranged from 10 to 50 per cent, five virulent strains and one avirulent strain of *E. gallinara* were isolated. The virulent strains when first isolated killed 16.6 to 33.3 per cent of the test fowls. Four of the five strains were virulent in the second generation, one in the third generation, and none in the fourth generation. Strains were obtained from other States for comparison, and only one, that from North Carolina, proved to be virulent for fowls. Some of the strains from other States produced temperature reactions when injected into test fowls, but others had no apparent effect. Attempts failed to increase the virulence of *E. gallinara* by passage through fowls, but it was found possible to maintain the virulence of a strain by such passage. The artificial inoculation studies showed that 60 to 70 per cent of fowls are naturally immune to fowl typhoid.

Three subcutaneous inoculations with living avirulent strains (vaccine) reduced the number of deaths in the vaccinated birds to one-third of those occurring in the nonvaccinated birds, as was determined by subsequent intraperitoneal inoculation of all the birds with virulent cultures. The results obtained led to the conclusion that vaccination against fowl typhoid is a procedure of considerable economic value.

Bacillary white diarrhea control in New Jersey, 1925-1927, F. R. BEAUDETTE and J. J. BLACK (*New Jersey Stas. Bul.* 458 (1927), pp. 16).—This is a detailed report of control work conducted in New Jersey during the years 1925-1927 in continuation of the work of 1924-25 (*E. S. R.*, 55, p. 74). The data, which are presented in large part in tabular form, show that, in general, the annual testing of flocks of birds reduces the percentage of infection found in them. A total of 39,689 certified birds were tested in 1925-26 of which 5.46 per cent reacted (*E. S. R.*, 55, p. 878), while of the 12,922 non-certified birds 15.19 per cent reacted. A total of 90,607 birds were tested in 1926-27 of which 10.85 per cent reacted.

Controlling white diarrhea (*South Dakota Sta. Rpt. 1927, p. 30*).—The application of the agglutination test for the detection of carriers of bacillary white diarrhea resulted in the prevention of losses from this disease.

AGRICULTURAL ENGINEERING

Technology in the agriculture of the United States of North America [trans. title], G. KÜHNE (*Ber. Landw. Reichsmin. Ernähr. u. Landw. [Germany], n. ser., Spec. No. 3 (1926), pp. [4]+100, figs. 99*).—The results of a survey of agricultural engineering practices in this country, made from the German viewpoint, are presented in considerable detail.

Stream flow in general terms, M. D. CASLER (*Amer. Soc. Civ. Engin. Proc., 54 (1928), No. 1, pt. 1, pp. 97-122, figs. 9*).—The purpose of this paper is to present a workable general method for the analysis of stream flow in irrigation channels in which the invert slope and the channel cross section are not constant. Demonstrations of the applicability of the method to weirs, orifices, and siphons are appended.

Flow of water in drainage ditches, C. E. RAMSER (*Engin. and Contract., 67 (1928), No. 1, pp. 7-10, figs. 20*).—Studies conducted by the U. S. D. A. Bureau of Public Roads in cooperation with the University of Illinois on the flow of water in 11 drainage ditches and in 1 natural river channel in central Illinois to determine the roughness coefficient n in Kutter's formula for use in the design of drainage channels are reported. The observations were made for a wide variety of conditions consisting of channels recently dredged, recently cleared, and badly choked with various kinds of growth.

The results showed conclusively that the usefulness of a drainage channel is appreciably impaired by the growth of vegetation, particularly in prairie regions where the land is comparatively flat. If it were not for the growth of vegetation, it appears that a rather low value of n could be used in the design of drainage ditches in this section. Unless a more effective method of maintenance than annual clearing is employed, it does not appear that a value of n less than 0.04 is justified. Using this value, the capacity of the channel will fall below its designed capacity during the latter part of the growing season. It is considered obvious that much higher values of n would be required in design where clearing every two years or less often is the general practice.

The effect of agricultural drainage upon flood run-off, S. M. WOODWARD and F. A. NAGLER (*Amer. Soc. Civ. Engin. Proc., 54 (1928), No. 1, pt. 1, pp. 165-183, figs. 10*).—A critical examination of the records of flow in the watersheds of the Des Moines and Iowa Rivers, made by the University of Iowa, is reported, showing that during flood periods there has been no significant change in the behavior of these streams which may be attributed to drainage. The total run-off from storms of like precipitation, the maximum rates of discharge, and the rain-water storage conditions within the basins seem to have been unaltered by the extensive drainage operations. It is to be noted that the drainage operations on the watersheds of these two rivers have involved the construction of tile drains, open ditches, and some straightening of stream channels.

The results of this investigation are taken to indicate, therefore, that agricultural drainage has had a negligible effect upon the magnitude of either the total flow or the maximum discharge of the floods of the Mississippi River.

Public Roads, [January, 1928] (*U. S. Dept. Agr., Public Roads, 8 (1928), No. 11, pp. 231-250+[2], figs. 16*).—This number of this periodical contains the status of Federal-aid highway construction as of December 31, 1927, together with the following articles: A Statistical Analysis of Highway-Railroad Grade-Crossing Accidents in 1926, by A. B. Fletcher and W. G. Elliot (pp. 231-242);

Highway Research Board Holds Its Seventh Annual Meeting, by A. C. Rose (pp. 243-248); Effect of Salts in Mixing Water on Compressive Strength of Mortar (pp. 248, 249); and Elementary Proof of Shale-Likeness of Clay Particles, by D. P. Krynine (p. 250).

Data on machinability and wear of cast iron, T. H. WICKENDEN (*S. A. E. [Soc. Automotive Engrs.] Jour.*, 22 (1928), No. 2, pp. 206-212, figs. 10).—The results of studies are reported which indicate that the hardness or chemical composition of an iron is, by itself, no indication of the wearing properties and machinability of the iron. Irons containing a large amount of free ferrite were found to wear rapidly, whereas others having considerable pearlite or sorbite in their structure showed good wearing properties. The presence in cylinder blocks of excess carbide spots or of phosphides of high phosphorus content is deleterious because such spots wear in relief and the material ultimately breaks out, acting as an abrasive that scores the surface of the piston and cylinder walls.

The addition of nickel or nickel and chromium to the iron is suggested as a means of obtaining the correct microstructure for a combination of good wearing properties and machinability. Since greater hardness is the result of a harder matrix rather than of an increase in the number of carbide spots, it has been found to be a good index of the improved resistance to wear, and to overcome the difficulty due to the hammering of the valves into their seats.

Analyses of cylinder blocks, pistons, and other engine parts in which nickel and chromium have been used are given, and the improvements secured in the performance of these parts are described.

Welding cast iron pipe (*Pub. Works*, 59 (1928), No. 2, p. 52, figs. 2).—Investigations are reported on vee, collar, and combined vee and collar joints in cast iron pipes. The results indicated that the collar type joint for a pipe was not as strong as it was thought to be. Cross bending tests showed that the bronze collar joint is only about 55 per cent as strong as the pipe itself when De Lavaud pipe is used and only 42 per cent as strong when sand-cast pipe is used. In all cases failure occurred in the cast iron at the edge of the collar.

Bronze welding was found to produce no change in the chemical properties or physical structure of the cast iron adjacent to the weld. Failure was due to a concentration of stresses in the cast iron next to the bronze collar. When cast iron was machined the machined surface was extremely difficult to tin, and there was very poor adhesion of the bronze to the surface, due apparently to the exposure of the graphite flakes. The machined surface was easily decarbonized by annealing to a bright red, after which the tinning operation became practically automatic. Tests made with the joints so prepared showed that the strength had increased to from 79 to 83 per cent of that of plain pipe, which is more efficient than any known mechanical joint.

Tests made with Class 150 De Lavaud pipe showed a breaking strength at shear-vee joints of 27,800 lbs. per square inch in one case and 24,500 lbs. in another. The most economical design was obtained by using a 40° bevel with the additional shear area about $\frac{1}{2}$ in. from the outside of the pipe wall. Little or no thickening or reinforcement is required, since the bronze has an ultimate strength greater than the pipe itself. The cost of the joint, including machining the pipe ends correctly, was slightly less than that of the collar type, but more expensive than the ordinary vee type.

Bond between concrete and hollow tile, J. C. OLEINIK (*Engin. and Contract.*, 67 (1928), No. 1, pp. 19-21, figs. 5).—Studies conducted by the Bureau of Standards, U. S. Department of Commerce, in cooperation with the Hollow

Building Tile Association on the strength of the bond between hollow tiles and concrete in shear, are reported.

The results in general indicated that the strength in shear of the bond between hollow tiles and concrete was greatest when concrete containing the minimum amount of water necessary for its proper placement was used in combination with dry or dipped tiles of medium absorption. For dry cured specimens, the bond strength in shear increased with the strength of the concrete blocks between the tiles. For specimens made from dry tiles, the bond strength in shear did not vary widely with tiles having absorptions between 5 and 20 per cent. Saturating the tiles reduced the bond strength in shear materially with tiles having absorptions between 5 and 20 per cent. Dipping the tiles did not reduce the bond strength appreciably. Damp curing increased the bond strength in shear of specimens made with dry tiles and concrete of wet consistency. With all other specimens, damp storage seemed to decrease the strength of the bond. For specimens made from New Jersey fire-clay tiles, the ratio between the strengths of the concrete blocks and the cylinders increased as the water-cement ratio increased and as the amount of water in the batch decreased.

The relation of electricity to Missouri agriculture, R. R. PARKS and J. C. WOOLEY (*Missouri Sta. Circ.* 165 (1928), pp. 11).—A brief outline of the activities of the station in connection with the development of rural electrification is presented.

Characteristics of some anti-knock fuels in internal combustion engines, M. K. THORNTON, JR., and R. FLAGG (*Tex. Engin. Expt. Sta. Bul.* 34 (1927), pp. 28, pls. 10).—The results of an investigation of the characteristics of anti-knock fuels and of materials to be added to ordinary fuels for use in internal-combustion engines are reported in considerable detail.

Tests were made on two different solutions of nitro aromatic hydrocarbons, a solution of tetraethyl lead, two gasolines containing large quantities of cracked hydrocarbons, materials containing large quantities of nitrobenzene, and materials consisting largely of nitrated hydrocarbons. The results indicated that the antiknock fuels and so-called doped fuels improved the operating characteristics of the engines, did not cause the power to fall off abnormally at high speeds, and did not cause high temperatures in the exhaust system. The consumption per horsepower hour was also not abnormally high at the higher speeds, there being little difference between the antiknock fuels and ordinary fuels in this respect. In the case of one of the nitrated hydrocarbons both the power and economy were improved.

It was found that while the use of such fuels will permit changes in engine design resulting in increased economy, there is little or nothing gained aside from the smoother performance of the engine when the price of these materials is considered. The use of these dopes and special fuels very materially increased the smoothness of engine operation at low speeds and under heavy loads. They also yielded satisfactory operation with the carburetor adjusted for a leaner mixture than with the ordinary gasolines.

Big teams on Illinois farms, E. T. ROBBINS (*Illinois Sta. Circ.* 324 (1928), pp. 16, figs. 15).—Practical information on the efficient use of big teams on Illinois farms is given, based on the experience of farmers.

The status of grain drying investigations (*Agr. Engin.*, 9 (1928), No. 1, pp. 14-16).—The results of a symposium on the latest developments in grain drying, as presented at the meeting of the power and machinery division of the American Society of Agricultural Engineers, November 29 and 30, 1927, at Chicago, Ill., are summarized. Most of the work reported upon has been done at the different agricultural experiment stations.

Electrically heated dry air sterilizers, A. W. FARBALL (*Agr. Engin.*, 8 (1927), No. 12, pp. 341-343, figs. 5).—Experiments conducted at the California Experiment Station on electrically heated dry air sterilizers for dairies showed that satisfactory bacterial reduction in milk cans may be obtained by sterilization in hot air at 230° F. or above for 30 minutes in a small four-can-capacity sterilizer, provided a good circulation of air is obtained in the sterilizer. Dry hot air sterilizers depending upon natural convection currents for carrying the heat were found to have considerable temperature variation throughout the sterilization compartment when loaded with utensils, and especially when heated rapidly. The temperature variation was not great when no utensils were in the sterilizer to interfere with convection currents.

The proper and most efficient location for the heater was found to be in the center of the bottom of the sterilizer, in order to assist in the setting up of natural circulation. It was found desirable to place baffles directly over the heating elements in order to prevent localized overheating of the equipment due to direct radiation. This also assisted in the formation and direction of convection currents. Tests with various sizes of elements showed that a 2-kw. heater is about the right size for use with a four-can sterilizer. This heater brought the sterilizer to a temperature of 230° in from 15 to 20 minutes, and could be turned off after about 45 minutes of operation. The maximum temperature reached was about 300°. When using a 3,000-watt or larger element, the temperature quickly rose above 300° and resulted in melting the solder on the utensils. Elements smaller than 2,000 watts did not bring the temperature to the proper point. The energy required per batch of 60 lbs. of equipment averaged 1.7 kw. hour.

Electric refrigeration and its agricultural uses, W. T. ACKERMAN (*Agr. Engin.*, 9 (1928), No. 1, pp. 23-27, figs. 2).—Data from studies of electrical refrigeration on seven different farms in New Hampshire are presented and discussed. The results to date indicate that refrigeration will in the future be the basic agricultural load.

Are farm buildings an expense or an investment? J. L. STRAHAN (*Agr. Engin.*, 9 (1928), No. 1, pp. 3-8, figs. 3).—Analysis is given of the cost of farm buildings on the investment basis. The general conclusion is that with proper management good buildings and equipment will pay. The results of the study as a whole are taken to indicate the need for research which will permit the statement of definite design conditions for farm buildings. A thorough investigation is also needed of the economics of production in dairy, poultry, and animal husbandry to be expressed in terms making them available for use by the engineer.

Equipment for swine production, B. M. ANDERSON and V. R. HILLMAN (*Kansas Sta. Bul.* 243 (1927), pp. 46, figs. 32).—It is the purpose of this bulletin to enumerate a number of essential and desirable features of swine production equipment and to describe and illustrate a variety of buildings and equipment that have proved practical on Kansas farms and elsewhere. A number of working drawings and bills of material for specific structures are included, together with a list of available building plans.

Poultry houses and fixtures, edited by H. W. JACKSON (*Dayton, Ohio: Rel. Poultry Jour. Pub. Co.*, 1926, 9. ed., pp. 320, figs. 302).—A large amount of information on the planning and construction of poultry houses and fixtures to meet varying conditions is presented.

The use of artificial lighting to increase winter egg production, J. E. DOUGHERTY (*Agr. Engin.*, 8 (1927), No. 12, pp. 343, 344, figs. 2).—The results of studies conducted at the California Experiment Station are reported which showed that in employing artificial lighting sufficient illumination should be

supplied to amply light the mash hoppers and scratching floor so that the birds can readily see to eat and scratch.

In a test of the relative efficiency of reflectors, one R. L. M. reflector using a 100-watt lamp was sufficient to give 0.8 foot-candle or more of light over all parts of the floor in front of the droppings board, whereas with two homemade reflectors, each containing a 50-watt lamp, the floor areas near the side walls and toward the rear of the pen received less than 0.8 foot-candle of illumination and the intensity elsewhere was less than with the dome reflector. The line of separation between the lighted area and the sharply defined shadow was 20 in. from the rear wall with the R. L. M. reflector and 8 in. with the homemade reflector. The R. L. M. reflector at a height of 7 ft. gave a more effective illumination of the pen for the same consumption of electricity than did the two homemade reflectors at 6 ft.

The use of lights in the morning only was found to be equally as effective as night lighting, and had the advantage of obviating the necessity of dimming the lights to get the birds on the roosts. The conclusion was drawn that extending the working day without keeping the hens busy eating and scratching can not be expected to bring results.

The greenhouse, G. LAMPMANN (*Der Gewächshausbau, Berlin: Wilhelm Ernst & Son, 1927, pp. VI+114, figs. 46*).—Information is given on the planning and construction of greenhouses from the German point of view.

Bacteria in creamery wastes, M. LEVINE and L. SOPPELAND (*Iowa Engin. Expt. Sta. Bul. 77 (1926), pp. 72, figs. 8*).—A systematic study of the organisms isolated from artificial creamery wastes is reported in which 36 species were described. A key for their identification is also presented. Strict anaerobes were found to be very rare, only one of the species being in this category. All of the other species were facultative and usually grew much better aerobically. More than half of the species were proteolytic, and digestion of the casein was retarded by acidity and the absence of air. In the presence of an abundant air supply acid production was depressed and proteolysis was markedly favored.

RURAL ECONOMICS AND SOCIOLOGY

Labour's policy on agriculture (*London: Labour Party, [1926], pp. 39*).—This report is issued as the official statement of labor's agricultural policy, and covers land ownership and use; wages and standards of living of agricultural workers; marketing; transportation; agricultural credit, insurance, education, and research; rural industries; afforestation; and electric power for the countryside.

The agricultural outlook for 1928 (*U. S. Dept. Agr., Misc. Pub. 19 (1928), pp. 52*).—This sixth annual report was prepared by the Bureau of Agricultural Economics, assisted by representatives of other bureaus of the Department and of the State agricultural colleges, State agricultural experiment stations, or State extension services of 21 States. It summarizes "the best available facts bearing upon conditions which farmers will probably face" when the 1928 crops are ready for market.

Agricultural outlook for Oklahoma, 1928, J. T. SANDEES, W. W. FETROW, J. O. ELLSWORTH, and J. F. PAGE (*Oklahoma Sta. Circ. 68 (1928), pp. 21*).—This circular includes a statement of the general agricultural situation and the agricultural prospects in Oklahoma for the year 1928.

Beans, H. R. WELLMAN and E. W. BRAUN (*California Sta. Bul. 444 (1927), pp. 62, figs. 17*).—This bulletin presents the results of a study including the production and consumption of beans in the United States; the varieties

grown; the markets and competition between varieties; the factors affecting seasonal variations, trends of prices, and purchasing power of beans in the United States and California; the foreign trade; and the cost of producing beans in Santa Barbara County, Calif., in 1927.

Costs of producing sugar beets.—X, United States, E. B. BROSSARD ET AL. (*Washington: U. S. Tariff Comm., 1928, pt. 10, pp. VII+112, figs. 22*).—This is the final bulletin of the series previously noted (E. S. R., 57, p. 84). It summarizes the costs of production of sugar beets in the United States, and analyzes the sugar beet industry for 1921, 1922, and 1923.

Economic aspects of the apple industry.—E. RAUCHENSTEIN (*California Sta. Bul. 445 (1927), pp. 76, figs. 17*).—This bulletin presents and analyzes the available data on the apple industry, with a view to giving California and other growers an understanding of the present status and future outlook of the industry. Part 1 (pp. 7-44) discusses the industry as a whole, considering the importance, production and its trends, total and seasonal shipments, markets, storage, canning and drying, prices and purchasing power and their trends in the United States, and the exports and imports of fresh, dried, and canned apples. Part 2 (pp. 45-71) deals more particularly with the industry in California and in different sections of the State. A considerable bibliography is appended.

The investigations were made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Sheep ranching in Utah.—A. C. ESPLIN, W. PETERSON, P. V. CARDON, G. STEWART, and K. C. IKELER (*Utah Sta. Bul. 204 (1928), pp. 58, figs. 8*).—This is the report of a preliminary economic survey of the sheep-ranch situation of Utah as of 1925, made in cooperation with the Bureaus of Agricultural Economics and Animal Industry, U. S. D. A.

The 54 records obtained are divided into groups on the basis of the number of breeding ewes on each ranch, as follows: (1) From 230 to 1,000, (2) from 1,001 to 2,000, (3) from 2,001 to 3,000, and (4) over 3,000. Tables are given showing for each group the amount and value of land owned and leased, the distribution of ranch investment, ranch indebtedness, average number and value of sheep and work stock, labor requirements, distribution of ranch expenses, distribution of ranch receipts, and a financial summary. The return on operator's equity was \$3,465, \$6,127, \$13,193, and \$15,035 a year in the respective groups, being 9.4, 15.1, 19.4, and 13.9 per cent. The average cost of production per breeding ewe was \$13.43, \$6.60, \$6.18, and \$5.15, respectively, for the four groups, averaging \$6.48. The percentages of total cost expense of different items were feed charges 16 per cent, labor (not including board) 35, shearing 4, taxes 8, interest paid 6, death and missing losses 19, depreciation (buildings and machinery) 4, and miscellaneous 8 per cent.

Correlation studies show that (1) there is little direct relation between the number of all sheep and the percentage of profits, (2) there is a high direct correlation between the percentages of the investment in sheep and the percentages of profit, (3) a large investment in land tends to decrease profits, (4) the percentages of profit tend to increase with the size of sales, but not as rapidly as might be expected, (5) the percentages of lamb crop have a small but direct influence on the percentages of profit, and (6) the number of yearling ewes kept for flock replacement is not a strong factor in production profits.

Ranch practices and also the survey data from 14 mixed sheep and cattle ranches are analyzed.

Studies in Vermont dairy farming.—III, Randolph-Royalton area, H. P. YOUNG (*Vermont Sta. Bul. 268 (1927), pp. 64*).—This bulletin is the third of the series previously noted (E. S. R., 56, p. 483), and reports the results of a study

made to estimate the factors in Vermont dairy farm organization affecting earnings, to evaluate the practices affecting the cost of milk production, and to guide successful dairy farm organization under Vermont conditions. It is based upon data from a farm business survey of 186 farms in 1922-23 in Randolph and Royalton, and was prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the Vermont Agricultural Extension Service.

A brief history of the development of farming and dairying in the area and a description of its present status, organization, and practices are given. The factors in farm organization, 1922-23—age, tenure, wages, labor incomes, farm capital, and receipts and expenses—and the factors affecting labor incomes are analyzed. Pages 40-61 analyze and discuss the factors affecting milk production costs in the area.

Nutritive ratio, production, percentage of digestible nutrients, crop acres, pounds of concentrates fed per cow, number of cows, capital, receipts, acre hay yields, and human labor units per man are correlated with each other or with other factors. It is concluded that "the region as a whole is now best adapted to the production of fluid milk."

Elasticity of supply of milk from Vermont plants: Factors affecting average deliveries per patron.—I, The milk-feed price ratio, A. R. GANS (*Vermont Sta. Bul.* 269 (1927), pp. 40, figs. 9).—This bulletin is the first of a series dealing with the factors affecting deliveries to Vermont milk plants. The general trends in the dairy industry of Vermont are described, the factors affecting deliveries to country plants are analyzed, and a method is presented for forecasting probable future deliveries. The statistical analysis is based on data of milk deliveries at two cooperative creameries, those at one including the period from January 1, 1921, to December 31, 1926, and those at the other for the period from December 1, 1916, to November 30, 1926.

Milk prices were "deflated" by dividing by the index of the feed price for the same period and then corrected for average seasonal variation. Multiple correlation analyses were made, using the following variables: X=deliveries; A=3-month cumulative average of the milk-feed price ratio, lagged 1.5 months; B=12-month cumulative average of the milk-feed price ratio, lagged 12.5 months; C=8-month cumulative average of milk-feed price ratio, lagged so that the period included did not overlap the periods in A or B; and D=12-month cumulative average of milk-feed price ratio, lagged 24.5 months. The multiple correlation analysis gave the following coefficients of correlation: $R_{X-AB}=0.6546$, $R_{X-ABC}=0.7497$, and $R_{X-ABD}=0.7603$.

The coefficient of correlation between the actual deliveries of butterfat per patron at the Richmond creamery from December 1, 1916, to November 30, 1926, and the deliveries "forecasted" from the estimating equation was $+0.9590 \pm 0.004$, and that for deliveries at the Middlebury creamery from 1921 to 1925, with the secular trend removed, was $+0.807 \pm 0.027$.

Returns for skimmilk fed to hogs under Vermont conditions. H. B. ELLENBERGER and R. D. APLIN (*Vermont Sta. Bul.* 273 (1927), pp. 15).—The results presented in this bulletin are based upon one year's records from 115 farms obtained by personal visits during March and April, 1927. Twelve debit and five credit items are considered in each record. Tables are given showing the cost of production per 100 lbs. of pork and return per 100 lbs. of skim milk fed for all hogs and by groups based upon the ratio of skim milk to grain, the amount of pork produced per farm, and the percentage of total receipts received for 4-weeks-old pigs, and also showing the returns per 100 lbs. of skim milk at different prices for skim milk, grain, and pork.

Land tenure and agricultural production in the Tropics, H. M. LEAKE (*Cambridge: W. Heffer & Sons, 1927, pp. IX+159, pl. 1*).—This is a discussion of the influence of the land policy on agricultural development in the tropical part of the British Empire.

A study of tenancy in central Illinois, G. W. KUHLMAN (*Jour. Land and Pub. Utility Econ., 3 (1927), No. 3, pp. 290-297, fig. 1*).—The results are given of a study made for the Institute for Research in Land Economics and Public Utilities of 120 farms, comprising 22,944 acres in Hensley Township, Champaign County, Ill., a township in which over 64 per cent of the farms are operated by tenants.

The organization of national agricultural credit institutions and the organization for international agricultural credit, L. TARDY (*L'Organisation Actuelle des Établissements Nationaux de Crédit Agricole et l'Organisation du Crédit Agricole International. Agen: Impr. Moderne, 1926, pp. 60*).—The necessity for credit specially adapted to agriculture, the principles that govern the organization of agricultural credit, the need of central institutions and the organization of such institutions in different countries, agricultural credit in France, and the organization of international agricultural credit are described and discussed. The conclusions regarding credit of the Twelfth International Congress of Agriculture, held at Warsaw in 1925, are included.

Social aspects of agricultural credit, B. Y. LANDIS (*New York: Fed. Council of Churches of Christ in Amer., Dept. Research and Ed., 1927, pp. 81*).—The purpose of this study is to summarize and interpret data upon agricultural credit in the United States from 1920 to 1927, inclusive, and to discuss certain aspects of special concern to churches and social institutions.

The farm tax problem in Arkansas, C. O. BRANNEN (*Arkansas Sta. Bul. 223 (1928), pp. 63, figs. 14*).—This bulletin presents the results of a study to determine the operation of the general property tax with particular reference to the agricultural group, and the relation of the fiscal system of the State to the distribution of tax benefits to the farm population. Using data for the years 1921-1925 on real estate rents and taxes collected by the survey method from 147 farms and 260 city real estate properties in 5 areas of the State and official records of net earnings and taxes of banks and certain public utilities groups, a study is made of the relation of taxes to farm rents and net earnings, of taxes and rents of city real estate, of taxes and earnings of State banks and railroad and telephone companies, and the problem of assessment and equalization. The system of State and local taxation and special assessments for rural highways and drainage and levee districts are discussed, and the school tax problem is analyzed, using the State records pertaining to assessed valuation, local district assessment, other revenues, school enrollments, etc. Suggestions are made for revising and equalizing the taxes and tax burdens.

Taxes (drainage and levee assessments not included) on the 147 farms studied varied from less than 5 to over 100 per cent of the net rent, averaging 18.1 per cent. The taxes (special assessments for streets, drainage, etc., not included) on the 260 city real estate properties studied averaged 16.7 per cent of the net rent, those on State banks in the 5 districts averaged 16.5 per cent of the earnings, the State, county, and local property taxes of railroads averaged 18.5 per cent of the net earnings, and those for the chief telephone companies 12.7 per cent of the net earnings. Of the rural tax dollar 39.8 cts. was used for schools, 41.2 cts. for roads, and 19 cts. for other purposes, 20.4 cts. being expended by the State, 19.6 cts. by the county, and 60 cts. by the local taxing unit. Of the city tax dollar 41.6 cts. went for school purposes, 25.8 cts. for roads, and 32.6 cts. for other purposes, 20.2 cts. being spent by the State, 19.5 cts. by the county, 18.5 cts. by the city, and 46.8 cts. by the local taxing unit.

The effects of shortage of farm storage space and inability to get local bank credit on the movement of Kansas wheat to market, R. M. GREEN (*Kansas Sta. Bul.* 244 (1927), pp. 29, figs. 6).—This bulletin presents the results of a study to determine the effects of shortage of farm storage space and inability to get local bank credit upon the marketing of Kansas wheat. The part of the bulletin pertaining to storage is based upon a study by counties of the production of wheat and the storage space available from 1915 to 1923, inclusive, special attention being given to 1920, 1922, and 1923. The credit study is based chiefly on farmers' replies to questions regarding the years 1921 and 1922.

The study shows that with average production not more than 3 to 4 per cent of the Kansas wheat crop is forced to market by shortage of farm storage space, and only about 10 per cent by inability of farmers to secure local bank credit. The two factors combined seem to cause a quantity of wheat equal to from one-half to two-thirds of the quantity ordinarily marketed in excess of the mill and export requirements to be marketed, the larger part being marketed in the first six months after harvest.

The demand side of the New York milk market, H. A. ROSS (*New York Cornell Sta. Bul.* 459 (1927), pp. 86, figs. 38).—This bulletin presents the results of a study of the sales records of six of the largest milk distributors of New York City for the period from 1919 to 1924, made to determine the factors affecting the demand for milk and their influence, to determine the demand for different products throughout the year, to formulate a method of forecasting sales of milk and cream, and to analyze quantitatively demand as a factor in milk prices.

Tables, maps, and graphs with text are included showing and discussing the amount of milk and cream sold and the daily retail sales per family by grades, size of bottle, and section of the city; the long-time trend and the seasonal and day-of-the-week variations in demand; and the effects of holidays, temperature, price changes, and other factors on demand.

The practical application of the study is briefly summarized.

Economic aspects of Ohio farmers' elevators, L. G. FOSTER (*Ohio Sta. Bul.* 416 (1927), pp. 77, figs. 31).—This bulletin, which is based upon data secured by a field survey of 265 companies in Ohio, traces the development of farmers' elevators in that State, and discusses some of the more important management problems of such elevators, special attention being given to buying, financial, grain handling, and grain grading policies; costs of operation; selling and accounting practices; storage of grain; and hedging. The handling of merchandise and livestock by such elevators is also discussed.

Marketing farm produce by parcel post, L. B. FLOHR (*U. S. Dept. Agr., Farmers' Bul.* 1551 (1928), pp. II+54, figs. 25).—Information is given in a popular way as to the possibilities of marketing farm products by parcel post, and for the assistance of producers and consumers in marketing by this method.

Great Lakes-to-ocean waterways, E. S. GREGG and A. L. CHICHESTER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Dom. Ser.* 4 (1927), pp. VI+134, figs. 34).—This is a survey of some of the economic aspects of the proposed Great Lakes-St. Lawrence, Lakes-to-the-Hudson, and all-American waterways. It is limited mainly to a study of potential traffic available for movement by the proposed routes, the possibility of lower freight rates to attract traffic from existing channels, the possibility of ocean-going vessels entering the Lakes trade via any of the proposed ship channels, and the economic benefits to be derived from the projects.

Report of the apple marketing enquiry committee [Nova Scotia], L. F. BURNETT ET AL. (*Hullfax: [Dept. Nat. Resources], 1927, pp. 31*).—This is a report of the committee of the Nova Scotia Department of Natural Resources

in regard to marketing methods. Suggestions for improvement in such methods are included.

Report[s] on the marketing of Nova Scotia apples in Great Britain (*Halifax: [Dept. Nat. Resources], 1927, pp. 16; pp. 14*).—These are two reports on marketing Nova Scotia apples in Great Britain, one by E. Leslie, secretary of the Nova Scotia Fruit Growers' Association; and the other by W. A. Middleton, provincial horticulturist of Nova Scotia.

Crops and Markets, [January, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 1, pp. 32, figs. 2*).—Tables, notes, reports, summaries, and graphs of the usual types are included. Special tables are given showing by States the acreage, yield per acre, and production, 1926 and 1927, of corn utilized in different ways, and the acreage, yield per acre, average price per pound, and value of different types of tobacco in 1926 and 1927.

The legal status of agricultural co-operation, E. G. NOURSE (*New York: Macmillan Co., 1927, pp. XIX+555*).—This is one of the series of investigations of the Institute of Economics in agricultural economics. The subject is treated from the viewpoint of the economist rather than of the lawyer, the purpose being to analyze the economic ideas and purposes seeking expression through cooperative organization and to ascertain in what degree legislatures and courts have comprehended and recognized these ideas and purposes. The development of different types of organizations and laws pertaining to them, the evolution of membership contracts and enforcement devices, the attitude of legislatures and courts regarding cooperation and restraint of trade, control of membership, equitable relief, and class legislation are discussed.

The appendixes (pp. 443-543) include several Federal and State cooperative acts and contract forms of several large cooperative associations.

Agricultural cooperative associations, marketing and purchasing, 1925, R. H. ELWORTH (*U. S. Dept. Agr., Tech. Bul. 40 (1928), pp. 98, figs. 40*).—This bulletin is the third of the series previously noted (*El. S. R., 52, p. 592*), and is based upon reports from more than 10,800 active associations and for approximately 1,500 associations which have ceased to function. A brief history is given (pp. 4-21) of the early associations, the status of the associations in 1912 and in 1915, and the changes from 1915 to 1925. Graphs, maps, and tables are presented showing by States and by commodities handled the number of associations, estimated membership, estimated business, and organization characteristics of the associations in 1925, and making comparisons between 1925 and 1915 and other years.

Farmers' cooperation in New Mexico, 1925-1926, A. L. WALKER (*New Mexico Sta. Bul. 164 (1927), pp. 58, figs. 11*).—Twenty-four cooperative marketing and four buying and selling associations with a total membership of 8,222 are functioning in New Mexico. This bulletin describes the types of organizations, their administration, and their marketing methods, and discusses the essentials of success in cooperative marketing of farm products and the problems and prospects of the New Mexico cooperative associations.

Appendixes include the text of the cooperative marketing laws of New Mexico, excerpts from the Agricultural Credits Act of 1923 (42 Stat. L. 1454), the marketing agreement of and application for membership in the Rio Grande Valley Cooperative Dairy Association, and graphs showing the freight rates on apples from different producing areas to different markets in the United States.

Principal types of cooperative relations between producers and consumers of agricultural products, G. FAUQUET (*Ann. Collect. Econ., 3 (1927), No. 1, pp. 64-79*).—A brief discussion of the principal types of relations existing

and possible between agricultural producers and consumers and cooperative organizations composed of one or both of them.

The export debenture plan, A. E. TAYLOR (*Northwest. Miller*, 153 (1928), No. 5, pp. 521, 522, 550).—Some of the aspects of the debenture plan for farm relief in the United States are discussed.

Concerning the wheat monopoly in Switzerland, P. GRABER (*Ann. Collect. Econ.*, 2 (1926), No. 3, pp. 193-320, figs. 2).—Wheat as a world problem and the wheat problem in Switzerland are described; a historical sketch is given of the origin, development, and operation of the State monopoly in Switzerland through 1925; and the arguments for and against such a monopoly and the monopoly measures before the Swiss Parliament are discussed.

Germany is provisioned with foods and feeding stuffs, I-IV, R. KUCZYNSKI (*Deutschlands Versorgung mit Nahrungs- und Futtermitteln, I-IV. Berlin: Julius Springer, 1926, pts. 1, pp. VII+176; 2, pp. [3]+406; 1927, pts. 3, pp. [3]+147; 4, pp. [3]+85*).—A detailed study of Germany's needs and production of foods and feeding stuffs in four volumes as follows: (1) Statistical Bases, by R. Kuczynski and P. Quante; and (2) Vegetable Foods and Feeding Stuff, (3) Animal Foods and Feeding Stuff, and (4) Food and Feeding Requirements as Related to Production, all by Kuczynski.

Rural life, N. BUXTON ET AL. (*London and New York: Longmans, Green & Co., 1927, pp. XI+102*).—This report, prepared by a commission appointed by the Copec Continuation Committee, covers land and its cultivators, housing, education, agricultural organization, rural industries, leisure and social relations, hygiene, electrical power, and the reconstruction of rural life. It is supplementary to the series of reports drawn up for submission to the Conference on Christian Politics, Economics, and Citizenship, held at Birmingham in April, 1924.

Family living on successful Minnesota farms, J. D. BLACK and C. C. ZIMMERMAN (*Minnesota Sta. Bul. 240 (1927), pp. 25, figs. 2*).—This is a study of 50 owner and 15 tenant farm families selected as the most successful out of a study of 477 owner and 217 tenant families in 13 communities in Minnesota.

Tables with explanatory text are included showing the sources of receipts and distribution of expenditures of the owner and tenant families, and making comparisons with those of the other families in the study, of families included in other studies, and the incomes of Minneapolis teachers, the staff of teachers of the College of Science, Literature, and Arts of the University of Minnesota, and other city families.

Church activities of farm women and their families, G. FERNANDES (*Oklahoma Sta. Bul. 169 [1927], pp. 14*).—The results are given of a study of church activities in relation to the part farm women play in establishing the economic status of their families. The study was based upon replies made to questions from 520 women about equally divided among 5 counties.

Church membership was claimed by 80.6 per cent of the women and 60.7 per cent of the husbands. In 58.8 per cent of the families both were church members, and in 16.5 per cent neither belonged. Of those reporting as to attendance at church, 52.3 per cent attended regularly, 29.1 per cent attended in their home community, and 52.2 per cent in a near-by town, the percentage of regular attendance being higher in the case of those attending in a near-by town. Slightly over one-half, or 51.2 per cent, of those reporting attended Sunday school, and only 88 out of 368 reporting belonged to or attended other church organizations.

Both the husband and wife were church members in 67.8 per cent of the owner families interviewed, and 51.1 per cent of the tenant families. In the case of 9.6 per cent of the owner families and 23.8 per cent of the tenant families, neither the husband nor wife was a church member.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Special courses for preparation of agricultural and home economics extension teachers, E. H. SHINN and F. A. MERRILL (*U. S. Dept. Agr., Ext. Serv. Circ. 55* (1927), pp. 23).—The answers from 300 county agents and 82 home demonstration agents to a questionnaire are tabulated and summarized in mimeographed form. The questionnaire covered the desirability of professional training in addition to technical training in agriculture and home economics subjects, the professional subjects considered of primary and secondary importance in undergraduate work, the desirability of postgraduate work and the most desirable subjects for such work, the desirability and nature of practical training in extension work before permanent employment, and the ways and means of supplementing previous training during employment.

Recommendations regarding the inclusion of professional studies in the training of extension workers, a suggested course for the junior and senior years' work, and a list of books and papers relating to subjects of interest to extension workers are included.

A manual for dairy calf club members, C. S. RHODE (*Illinois Sta. Circ. 322* (1928), pp. 28, figs. 14).—A manual for dairy calf club work, organized on a three-year plan.

The courses in entomology offered in American colleges, R. C. SMITH (*Kans. Agr. Col. Bul., 12* (1928), No. 1, pp. 23).—Tables are included showing the titles of the courses in entomology given in 148 American colleges in 1926-27, and the courses in each institution. Data pertaining to the support of the institutions, the credit given for first courses, the department of the college in which the courses are given, and similar data are tabulated.

The Ministry of Agriculture and Fisheries, F. L. C. FLOUD (*London and New York: G. P. Putnam's Sons, 1927*, pp. [10]+330).—This book describes the organization and work of the Ministry of Agriculture and Fisheries of Great Britain, which has functions relating to agricultural education, agricultural research, livestock improvement and diseases, horticulture and plant diseases, agricultural economics, rural industries, land, land holdings, land improvement, agricultural labor, and commercial control of seeds, fertilizers, feedstuffs, etc. Descriptions are also included of the Fisheries Department (pp. 273-299), by H. G. Maurice, of the Kew Gardens (pp. 300-308), and of the Ordnance Survey (pp. 309-318).

FOODS—HUMAN NUTRITION

Curing and preserving citron, L. McCULLOCH (*U. S. Dept. Agr. Circ. 13* (1927), pp. 8, figs. 3).—This publication contains brief directions for selecting, curing, and preserving citron.

The effect of muscular work upon the endogenous catabolism of the tissues, H. H. MITCHELL and J. H. KRUGER (*Jour. Biol. Chem., 76* (1928), No. 1, pp. 55-74).—This paper contains a critical review of the literature dealing with the relation of muscular contraction to protein metabolism, particularly the problem as to whether or not there is an inevitable disintegration of muscle protein or other nitrogenous compounds as a result of muscular activity, and the report of a series of experiments conducted on rats to determine the effect of muscular work on the excretion of total urinary nitrogen and later of urinary creatinine.

In the opinion of the authors the necessary conditions for the experimental attack on this problem involve the use of a diet which is approximately nitrogen-free and at the same time approximately adequate in energy value, and the continuation of the period of nitrogen-free feeding until the urinary

nitrogen approximates the endogenous level. Very few of the experiments reported in the literature are considered to fulfill these conditions. In the present study, metabolism experiments were conducted on rats in glass metabolism cages described in a previous publication (E. S. R., 52, p. 762), provided with devices for keeping the animal from moving during the rest periods and in active exercise during the activity period. The diets used contained only small amounts (approximately 4 per cent) of protein of high biological value (dried egg white), one diet consisting chiefly of carbohydrate and another of fat.

In both series there was no appreciable increase in the excretion of total endogenous nitrogen or of creatinine in the urine, and hence presumably no appreciable increase in the catabolism of muscle tissue. "Therefore, an increased catabolism of muscle tissue is not an inevitable consequence of increased muscular activity. This is true whether the diet is predominantly carbohydrate in character or whether it is predominantly fat and contains only traces of carbohydrate. It is equally clear, however, that if the diet does not provide sufficient nonnitrogenous nutrients to supply the working muscle with energy, the muscle tissue itself may be sacrificed for this purpose. Whether an accelerated breakdown of muscle tissue results from any other contingency during contraction can not definitely be decided from available information, although several possibilities suggest themselves."

Does the amount of food consumed influence the growth of an animal? H. H. MITCHELL (*Science*, 66 (1927), No. 1720, pp. 596-600).—In this discussion of the necessity of determining the food consumption of the experimental animals in all nutritional studies, specific illustrations are given from published investigations to show the errors involved in the assumption that the amount of food an animal consumes has no effect on growth or is determined solely by its value in nutrition.

"An experimental animal is considered as a sort of biological reagent of marvelous accuracy and varied uses, capable of giving as significant a response in body weight change to a change in ration as the color response of a chemical indicator to a change in hydrogen ion concentration around the point of neutrality. Unfortunately this conception of the infallibility of experimental animals can not go unchallenged, and the methods of experimentation blindly involving this conception are in need of revision. They can not be considered to be properly controlled except when the rations whose nutritive effect it is desired to compare are fed in equal amounts to comparable animals. Even when the amounts thus fed are inadequate, due to the refusal of the experimental animals to consume readily one or both of the rations, it is reasonable to expect that the inferior ration will ultimately induce a greater decline in weight than the other, or that it will lead to total nutritive collapse sooner."

Studies in fat metabolism.—I, The influence on blood lipids of single foodstuffs, C. W. MCCLURE and M. E. HUNTSINGER (*Jour. Biol. Chem.*, 78 (1928), No. 1, pp. 1-18, figs. 4).—Data are reported on lipid, nitrogenous, and dextrose fractions of the whole blood and the iodine numbers of the cholesterol and total fatty acids of the blood of apparently normal young adults during the fasting state, after the duodenal introduction of oleic acid, after the ingestion singly of relatively pure foodstuffs, including olive oil, hard-boiled egg white, and chemically pure dextrose, and after the ingestion of a fat-free meal composed of 60 gm. of grapes, 70 gm. of Karo sirup, 70 gm. of hard-boiled egg white, a cup of coffee with 6 gm. of sugar, and an orange.

Analyses made at hourly intervals on the fasting blood showed, with few exceptions, only insignificant changes in all of the substances determined.

However, similar analyses of the fasting blood of a given individual at intervals of weeks or months showed considerable variations in the dextrose and lipid content.

Following the ingestion of foods, the nitrogenous substances were increased only by protein foods and to an extent comparable with data reported by Folin and Berglund (*E. S. R.*, 47, p. 462). Fat ingestion caused a diminution in the nonprotein nitrogen, urea, and sugar concentrations, as also noted by Folin and Berglund. Dextrose ingestion was followed by temporary decreases in the amino acid nitrogen. As judged by the iodine numbers obtained, increases in total fatty acids noted after the ingestion of all types of food were not due to oleic acid. Marked changes in the iodine numbers were obtained as early as the first hour of observation, these changes frequently preceding marked variations in total fatty acid concentration. Only negligible variations were observed in the lecithin phosphorus concentration after the ingestion of different types of food, with the exception of oleic acid, which caused a marked increase.

In discussing the significance of these results, the presence in the blood of different forms of cholesterol, possibly tautomeric, of varying degrees of unsaturation is suggested.

New dietary deficiency with highly purified diets.—II, Supplementary requirement of diet of pure casein, sucrose, and salt, H. M. EVANS and G. O. BURR (*Soc. Expt. Biol. and Med. Proc.*, 25 (1927), No. 1, pp. 41-48, fig. 1).—A further study of the "pure" diet described in the previous paper of the series (*E. S. R.*, 57, p. 791) has confirmed the earlier observation that it is not adequate for normal growth even though supplemented by very high levels of vitamins A, B, D, and E. The diet is sometimes, but not always, adequate for ovulation but is not adequate for lactation. The inadequacy for lactation is corrected by increased dosage of yeast, and for growth and ovulation by small daily doses of lettuce or liver or by the inclusion of lard in the diet. The authors are of the opinion that the diet in question is lacking in an unknown member of the vitamin class.

On the amount of vitamin B required during lactation, H. M. EVANS and G. O. BURR (*Jour. Biol. Chem.*, 76 (1928), No. 1, pp. 263-272).—The authors report an attempt to find suitable supplements for the lactation period for diet 232, which the studies noted above had shown to be adequate except for this period.

A preliminary study of the relative values of various sources of vitamin B in promoting growth in young rats from the twenty-first day of life showed that 10 per cent of yeast (corresponding to about 0.6 gm. daily), 10 per cent of rice polishings, or about 3 drops of tikitiki, an extract of rice polishings, supply sufficient vitamin B for approximately normal growth for the period between 21 and 90 days. For normal lactation, as judged by survival of the young and weight at weaning, 15 per cent or more of yeast was barely sufficient. Supplementing 0.6 gm. of yeast daily with 3 drops of tikitiki, in itself insufficient for lactation in daily doses of 10 drops, rendered the diet entirely satisfactory for lactation.

This is thought to indicate that the supplement needed for lactation is the antineuritic vitamin [vitamin F] rather than the other factor of vitamin B [vitamin G], which the authors refer to as growth-promoting vitamin B.

Development of paralysis in the suckling young of mothers deprived of vitamin E, H. M. EVANS and G. O. BURR (*Jour. Biol. Chem.*, 76 (1928), No. 1, pp. 273-297).—That lack of vitamin E is responsible for a peculiar paralysis in suckling rats appears to be demonstrated in this report, in which data are given on the incidence and outcome of the paralysis on various simplified diets adequate for growth and on curative and prophylactic experiments in

which failure resulted with every material tested except preparations of vitamin E and food materials rich in this vitamin. These were able to prevent the disease and in some instances to cure it.

The paralysis has been found to develop a day or two before the weaning day (twenty-first day) in young rats fed the diet described in the previous paper, supplemented with sufficient yeast or other source of vitamin B for growth of the suckling young. The paralysis begins with difficulty in regaining the use of the limbs when the rats are placed on their backs, and increases until part of the musculature of the body and the posterior extremities are paralyzed. The paralysis is always partial and if severe is incurable, although the animal appears normal in other ways.

Vitamin A deficiency and urolithiasis. E. C. VAN LEERSUM (*Jour. Biol. Chem.*, 76 (1928), No. 1, pp. 137-142, pls. 2).—Essentially noted from another source (E. S. R., 58, p. 493).

Refection, a transmissible change in the intestinal content, enabling rats to grow and thrive without vitamin B in the food. L. S. FRIDERICIA, P. FREUDENTHAL, S. GUDJONSSON, G. JOHANSEN, and N. SCHOUBYE (*Jour. Hyg. [London]*, 27 (1927), No. 1, pp. 70-102, figs. 10).—The authors propose the name refection (from the Latin "reficere," to restore) as a descriptive term for a phenomenon of acquired immunity to vitamin B deficiency which they have observed in some rats on a vitamin B-free diet, and which they describe in considerable detail under the following headings:

I. *Symptoms, etiology, and pathological anatomy of refection.*—The basal diet used in their vitamin B studies contained 57 per cent of pure rice starch, together with casein purified by extraction with both acetic acid and alcohol, pure butterfat, agar, and McCollum and Davis salt mixture. On this diet some of the rats, after showing evidence of vitamin B deficiency in weakness of the hind legs, cessation of growth, and lowering of body temperature, suddenly began to grow at a normal rate while at the same time their feces became white and bulky. Feeding of the changed feces for several days to other young rats was found to bring about the same effect, and it was this restoration to normal on the deficient diet which has been named refection. Since the rats were kept on raised screens, the ability to continue on the vitamin B-free diet after refection was once established is considered to indicate that it can be transmitted by indirect contact. In the 20 cases of spontaneous refection observed, the susceptibility appeared to be greatest during the second week of life.

Material from the ceca of relected rats proved capable of transmitting the refection. The active material as found in the feces did not pass through the pores of Berkefeld or coarse Chamberland filters, and retained its activity after being kept in the dry state for 6 months and also after heating at 80° C. for 10 minutes, but not after heating at 100° for the same length of time. An aqueous suspension of the feces in a sealed tube heated at 80° for 10 minutes and incubated at 37° for 24 hours proved toxic, but a similar suspension mixed with powdered calcium carbonate in a flat Petri dish and incubated for 24 hours at 37° was very active.

On autopsy the relected rats were found to be normal both on macroscopic and microscopic examination.

II. *Nature and causation of the white feces of relected rats.*—Chemical analyses of the bulky white feces characteristic of refection as compared with those of nonrelected rats on the same diet and of rats on an adequate diet showed a much higher percentage of starch in the feces of the relected rats than of those on the other two diets. Metabolism experiments conducted on the three groups indicated for the relected rats a utilization of about 65 per

cent of the starch, 80 per cent of the nitrogen, 94 to 96 per cent of the fats, and 70 per cent of the total dry matter ingested, and for the other two groups a utilization of from 98 to 99 per cent of the starch, 90 to 91 per cent of the nitrogen, 94 to 98 per cent of the fat, and 93 to 94 per cent of the total dry-matter. The rate of passage of food through the intestinal tract was about the same in all of the groups. The white feces were found to contain amylase capable of acting upon the grains of rice starch but not upon the starch in the feces. Ptyalin also proved capable of acting upon the starch in the white feces.

III. Production of vitamin B in the intestinal tract of retracted rats.—The principal point brought out in this section is that the bacterial flora of the ceca of the retracted rats is different from that of nonretracted rats, as is also the H-ion concentration, which is alkaline in nonretracted rats on a vitamin B deficient diet and acid in normal rats on a mixed diet and in the retracted rats. Attempts made to bring about the refection in adult rats were unsuccessful.

IV. Connection between the different effects of refection. Attempts at refection in rats on a diet devoid of vitamin A and in other animals than rats.—The white feces of retracted rats turned brown following the feeding of a diet containing adequate vitamin B, thus showing a disappearance of the defective starch digestion. The brown feces of rats on an adequate diet did not turn white when the rats were fed the white feces of retracted rats, although many undigested starch grains were present in the feces during the period of feeding. When retracted rats were fed diets devoid of starch and of vitamin B, they declined in weight but continued to live for some time. When the starch was replaced by dextrin the animals remained retracted for some time, and the feces, though brown, contained some starch granules. These observations are considered to indicate that refection is intimately connected with defective digestion of starch.

The feeding of the white feces of retracted rats had no effect upon rats suffering from vitamin A deficiency. Preliminary attempts to retract mice were partially successful and with pigeons unsuccessful.

Spontaneous cures in rats reared upon a diet devoid of vitamin B and antineuritic vitamin. M. H. Roscoe (*Jour. Hyg. [London]*, 27 (1927), No. 1, pp. 103-107).—The author reports the spontaneous occurrence of refection among rats on a vitamin-free diet containing raw starch. The phenomenon, which was noted before the foregoing observation of Fridericia et al had been reported, differed from it in certain particulars. It occurred in some instances in rats deprived of either vitamin F or G, but not of both, and in both cases with the occurrence of refection the characteristic symptoms of deficiency of either of these factors disappeared. Refection has also occurred spontaneously and has been induced in rats receiving some addition of both factors of vitamin B.

Refection was found to be impossible when the total carbohydrate of the diet was soluble, although if only a small amount of insoluble starch was present it occurred. Steaming the diet to break up the starch grains prevented refection, and such treatment, or the use of starch in place of dextrin, is recommended for vitamin B experiments.

Some evidence was obtained that if unusual precautions are taken to prevent the rats from consuming their feces refection is impossible.

A note on technique in testing for vitamin B. A. L. BACHARACH and G. A. HARTWELL (*Analyst*, 52 (1927), No. 612, pp. 145-149, figs. 4).—In this cooperative study the authors have tested in their respective laboratories variations in the technique of vitamin B determinations. The method which has been developed

in each laboratory is based upon the recommendations of Drummond and Watson (E. S. R., 48, p. 12), modified by Bacharach by the omission of lemon juice (E. S. R., 55, p. 309) and by Hartwell by cooking (E. S. R., 55, p. 411), slight differences in manipulation such as the administration of vitamin B extract with the diet or separately, the use of tap water or distilled water, and the use of piebald or white rats.

Three experiments were run under identical conditions in the two laboratories. In the first each investigator used his own technique with piebald rats. Closely similar curves were obtained both in the loss in weight on the basal ration alone and in the response to the administration of marmite. The second experiment consisted of a comparison in each laboratory of the response of the two types of rats and again no marked differences were obtained. The third experiment consisted of a comparison of the raw and cooked diet. The curves obtained in both laboratories showed more rapid loss of weight on the raw than on the cooked diet, but if not given a vitamin B supplement the animals died without developing typical symptoms of B deficiency while on the cooked diet these symptoms developed. This is thought to indicate that the raw diet is preferable in testing basal diets for absence of vitamin B, but that the cooked method is preferable for testing for the presence of vitamin B in food materials. It was also noted incidentally that the exact age of the animals and their initial weight were unimportant in vitamin B tests.

Vitamin C content of canned spinach (*South Dakota Sta. Rpt. 1927, p. 14*).—In continuation of the study previously noted (E. S. R., 56, p. 696), spinach blanched for 2 minutes in boiling water and processed for 70 minutes at 15 lbs. pressure was found to protect guinea pigs against scurvy in 10-gm. daily doses. This method of canning spinach is consequently recommended in place of the customary blanching for 15 minutes in steam and processing for 90 minutes at 15 lbs. pressure.

The absorption spectrum of ergosterol in relation to the photosynthetic formation of vitamin D, R. A. MORTON, I. M. HEILBRON, and E. D. KAMM (*Jour. Chem. Soc. [London], 1927, Aug., pp. 2000–2005, figs. 2*).—Changes in the absorption spectrum of ergosterol on irradiation in alcoholic solution, as determined with the Hilger E₃ quartz spectrographs, are reported for half-hour intervals up to 150 minutes, with a final determination at the end of 6 hours. The absorption curves at these intervals showed a gradual disappearance of selective absorption in the region 280 to 300 μ m and the appearance of a new selective absorption in the region of 230 to 260 μ m, with a maximum at 247 μ m. This new band disappears with further irradiation, as shown by the curve at 6 hours. These curves are considered to indicate that the irradiation of ergosterol in solution or in the solid state is quite unlikely to give pure vitamin D unless special precautions are taken to screen off the radiations between 225 and 270 μ m by using Vitaglass screens with the quartz mercury vapor lamp or by irradiating with suitably treated carbon arcs with little or no emission on the ultra-violet side of 270 μ m.

The photochemical production of vitamin D from ergosterol, O. ROSENHEIM and T. A. WEBSTER (*Lancet [London], 1927, II, No. 12, pp. 622–625*).—Continuing their investigation of the production of vitamin D by the irradiation of ergosterol (E. S. R., 57, p. 492), the authors have attempted to determine the conditions for the maximum production of the vitamin, using the ultra-violet radiations of the mercury vapor lamp as the source of energy.

On exposing 0.1 per cent solutions of ergosterol in pure ether or alcohol at a distance of 20 cm. from the lamp for periods of from 30 minutes to 4 hours, it was found that the maximum amount of antitrachitic activity was produced within half an hour and that irradiation for 4 hours produced the same yield as

for 30 minutes, although the amount of unchanged ergosterol had been reduced from 90 per cent at the end of 30 minutes to 10 per cent. The minimum protective dose, determined by animal tests, was 0.0001 mg. at the end of each period. This consistency of activity is thought to contradict the above-noted theoretical conclusions of Morton, Heilbron, and Kamm, based on spectroscopic observations, that prolonged irradiation is a necessity for satisfactory yield and that the mercury vapor lamp is unsuited for this reaction. In attempting to explain the results obtained in the present study, two possibilities are suggested: (1) That a state is reached at which the two reactions, ergosterol→active substance and active substance→inactive products, proceed at equal rates until the ergosterol is exhausted, and (2) that the effect may be due to an impurity contained in ergosterol and identical with the one shown to be the cause of the induced activity of cholesterol. Attempts to obtain evidence of the presence of such an impurity in ergosterol have, however, been unsuccessful.

Experiments are also reported whereby alcoholic solutions of ergosterol were rendered antirachitic by exposure to ordinary sunlight in quartz tubes filled with nitrogen, thus showing that the ultra-violet radiations of relatively longer wave lengths are capable of effecting this change. This was also shown by the activation of solutions of ergosterol in ether, alcohol, and gasoline by exposure to ultra-violet radiations from a mercury vapor lamp after passage through Vitaglass, which cuts out some of the shorter rays. Cholesterol obtained from pigskin fat has been shown to contain a substance having the same optical properties as ergosterol. These observations are all thought to prove that the curative effect of sunlight in rickets is due to the conversion into vitamin D of the ergosterol in the fat of the skin.

Absorption bands of ergosterol and vitamin D. I. M. HEILBRON, E. D. KAMM, and R. A. MORTON (*Nature [London]*, 120 (1927), No. 3026, pp. 617, 618).—A letter in reply to the foregoing paper of Rosenheim and Webster.

Antiricketic substances.—VII, Biochemical and spectroscopic studies on purified chloesterol, C. E. BILLS, E. M. HONEYWELL, and W. A. MACNAIR (*Jour. Biol. Chem.*, 76 (1928), No. 1, pp. 251-261, pl. 1).—In this continuation of the series of papers previously noted (*E. S. R.*, 57, p. 294), the authors describe in greater detail than in previous papers the technique of the line test for vitamin D as developed in their laboratory, and report the results obtained with it in the examination before and after irradiation of cholesterol purified in various ways. All of the preparations were also examined at the Bureau of Standards, U. S. Department of Commerce, for absorption spectra.

Commercial cholesterol recrystallized from ether after filtration through Whatman No. 50 acid-hardened paper showed no antirachitic properties before irradiation. After irradiation by exposure in thin films for 15 minutes 36 cm. from a 220-volt Uviarc operating at 170 volts across the arc, the cholesterol preparation showed minimum curative properties (++) at a concentration of 0.01 per cent. A comparison of the spectrograms of a solution of this preparation with ergosterol solutions of varying concentrations indicated that the cholesterol contained about 0.12 per cent of ergosterol. Both cholesterol and ergosterol showed characteristic absorption bands at 293.5, 282, and 270 μ , and in addition a faint but distinct band at 260 μ . Moreover, a solution of the cholesterol and another of specially purified cholesterol to which ergosterol had been added in the same proportions as found in the unpurified cholesterol showed identical rates of destruction by potassium permanganate in acetone.

These observations are all thought to afford conclusive proof that the activatable ergosterol-like contaminant in cholesterol is ergosterol, as previously suggested by various investigators. Cholesterol purified by charcoal and also

by bromine was, however, still activatable by ultra-violet rays, although the minimum curative doses were about 30 times that of the original cholesterol. The failure of others to observe any antirachitic properties in irradiated cholesterol freed from ergosterol is attributed to the use of too small an amount of the material in curative tests. Some of the twice-brominated cholesterol prepared by Windhaus was also found to be active in amounts 30 times that of the original preparation. Spectroscopic examination of these preparations showed five faint absorption bands at 315, 304, 293.5, 282, and 269 μ , the last three apparently being identical with three of the ergosterol bands. It is concluded that "the activatability is due either to cholesterol itself, or to a hitherto undiscovered impurity which persists after three purifications with bromine. In either case the activatability is associated with absorption bands at 315 and 304 μ ."

TEXTILES AND CLOTHING

The lattice structure of swollen cell wall determined by the X-ray method, O. L. SPONSLER and W. H. DOBE (*Amer. Jour. Bot.*, 14 (1927), No. 10, pp. 626, 627).—X-ray diffraction patterns (E. S. R., 56, p. 297) obtained from mercerized ramie fibers showed that the chains of $C_6H_{10}O_5$ units of which the untreated cell wall is formed are moved bodily to new lattice positions by the alkali treatment but are not broken up. In the direction of the long axis of the fiber no change has occurred in spacing, although several lines show by their change in density that certain atoms have shifted their position. The volume of the elementary cell remains the same as before treatment.

Investigations to date led to conclusions that the forces associated with swelling involve the secondary valence forces rather than the primary valences, and that no new chemical compounds are formed; that the swelling is due to the movement of units of molecular size; that the evidence points to a direct contradiction of Nägeli's micellar hypothesis; that the chain of C_6 units remains intact, although the alternate units have turned somewhat on the long axis of the chain; and that the glucosidal linkages between the C_6 groups have not been disturbed nor has the amylen oxide ring structure been broken by the mercerization process.

A method for measuring the color of textiles, W. D. APPEL (*Amer. Dyestuff Rptr., Sample Swatch Quart.*, 1928, Jan., pp. 49-54, figs. 7).—A simple and relatively inexpensive method used at the U. S. Bureau of Standards for measuring the reflection of colored fabrics and other surfaces at a few wave lengths in the spectrum is described. The method may be used in determination of the relation between the weight of a given dye and the color of a fiber dyed therewith and of the effect of washing or light on dyed fabrics.

Monochromatic light filters for the visible spectrum, W. C. HOLMES (*Amer. Dyestuff Rptr., Sample Swatch Quart.*, 1928, Jan., pp. 31, 32, fig. 1).—Formulas for a series of nine inexpensive monochromatic filters in the visible spectrum are given in this contribution from the U. S. Department of Agriculture.

The use of the spectrophotometer in the dyestuffs industry, O. Z. DRAVES (*Amer. Dyestuff Rptr., Sample Swatch Quart.*, 1928, Jan., pp. 45-49, figs. 2).—Experience with the spectrophotometer as an aid in the accurate standardization of dyestuffs is described, with observations on technique.

Perspiration, with special reference to direct colors on cotton piece goods, W. M. SCOTT (*Amer. Dyestuff Rptr., Sample Swatch Quart.*, 1928, Jan., p. 69).—Investigation by the American Association of Textile Chemists and Colorists led to the suggestion of two solutions for use in artificially testing the

fastness of dyestuffs to perspiration. The solution simulating perspiration acid in reaction included 10 gm. sodium chloride, 1 gm. lactic acid U. S. P., and 1 gm. monosodium orthophosphate, with enough water to make up a total volume of 1 liter. The alkaline solution included 10 gm. sodium chloride, 4 gm. ammonium carbonate U. S. P., and 1 gm. disodium orthophosphate, with enough water to make up 1 liter total volume. A number of dyes listed, when dyed in the regular manner on cotton piece goods, showed practically no change in shade or staining of white cotton in either the acid or alkaline test.

Washroom practice in the power laundry and its relation to dyed fabrics, G. H. JOHNSON (*Amer. Dyestuff Repr., Sample Swatch Quart., 1928, Jan., pp. 54-59*).—Temperatures and washing formulas are indicated for different groups of dyed fabrics handled in the power laundry.

HOME MANAGEMENT AND EQUIPMENT

Factors in the management of the ice cooled refrigerator in the home, R. JORDAN (*Indiana Sta. Bul. 316 (1927), pp. 32, figs. 4*).—The results of investigations are presented which indicate that the temperature in the food chamber of a refrigerator rises rapidly after the ice has melted to below half the capacity of the ice chamber. Frequent opening of the doors of the refrigerator, loading the food chamber to capacity, and high outside temperatures are factors which cause an increase in ice consumption and also a rise in the temperature in the food chamber.

It was found that in a side-icing refrigerator the temperature at the top shelf may be 8° or more higher than that part of the food chamber underneath the ice chamber. It appears that this difference in temperature is sufficiently great to make a considerable difference in the time in which certain foods spoil.

House drainage and sanitation, F. J. TAYLOR (*Estate Mag., 26 (1926), No. 11, pp. 829-839, figs. 10*).—Considerable information is given on the disposal of residential sewage under rural conditions in England, including drawings of fixtures.

MISCELLANEOUS

Seventh Annual Report [of Georgia Coastal Plain Station], 1926, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 8 (1927), pp. 55, fig. 1*).—This contains the organization list and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1927], J. W. WILSON (*South Dakota Sta. Rpt. 1927, pp. [2]+36*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and department reports on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Abstracts of Bulletins 347-365 and Circulars 43-47, A. D. JACKSON (*Texas Sta. Circ. 49 (1928), pp. 22*).—The publications abstracted have been previously noted. Abstracts of several articles appearing in scientific and popular journals are appended.

NOTES

Iowa College and Station.—Fordyce Ely has resigned as assistant chief in dairy husbandry to become head of the dairy work at the Kentucky University and Station, beginning April 1.

Massachusetts College.—Two changes in the curriculum have been authorized. The first of these, effective next fall, permits a selected group of honor students to choose a three-credit course to run 1, 2, or 3 terms of their final year without restrictions as to subject and instructor. The second change provides for a reduction in the number of major courses from 17 to 5, namely, agriculture, horticulture, home economics, natural sciences (physical and biological), and social science (economics, humanities, and social science). This arrangement provides for greater specialization and at the same time a broader training than has hitherto been possible.

Michigan College.—Leave of absence has been given President K. L. Butterfield. Dean R. S. Shaw has been appointed acting president. L. D. Kurtz, extension specialist in farm crops, has resigned to become specialist in agronomy in the extension division of the Montana College, succeeding A. J. Ogaard, resigned.

Cornell University.—The cross of the Commander of the Order of the White Rose, the highest honorary decoration of Finland, has been conferred on Dean A. R. Mann in recognition of his services in connection with the development of agricultural education.

Ohio State University.—*Science* notes that Dr. John H. Schaffner, professor of botany, has been appointed research professor of botany in recognition of his experiments with plants.

Pennsylvania College.—The first spray service school was held at the college March 6-8, with an attendance of about 50 fruit growers. Two mornings were devoted to a study of the structure and function of the plant leaf and the relation of the scab fungus to the leaf tissue, two afternoons to a study of insect pests of orchards, and the final day to methods of preparing and applying sprays.

Texas Station.—Dr. B. Youngblood, director since 1911, but on leave of absence since 1926 to carry on cotton marketing research with the Bureau of Agricultural Economics of the U. S. Department of Agriculture, has resigned to give full time to his work with the Department. A. B. Conner, acting director since July 1, 1926, has been appointed director, beginning May 1.

Albanian American School of Agriculture.—This school, of which Dr. C. Telford Erickson is president, was opened 2 years ago. A land grant of 1,000 acres was tendered by the Government, to which the land and buildings are to revert after 25 years. The present number of students is about 75.

Agricultural Research in South Australia.—The South Australia Agricultural Education Act of 1927 provides for payments to the University of Adelaide of £5,000 for 1927-28 and with increases to £15,000 by 1936-37. These funds are to be used for the extension of research in agriculture and allied subjects in the Waite Agricultural Research Institute. In return for these grants the institute is to conduct research in cereal breeding, plant genetics and plant nutrition, the improvement of pastures and pasture plants, agricultural chemistry in its application to the production of farm crops, and soil manage-

ment and classification. It will also maintain divisions of entomology and plant pathology for investigations and an additional advisory service in these subjects and undertake any investigations in agricultural lines desired by the Minister of Agriculture.

The university is to maintain a degree course in agricultural science for the training of graduates for service in the Department of Agriculture and other Government departments. During the ten-year period the council of the university may nominate not to exceed four holders of the B. S. degree to the various departments for appointment at salaries of not less than £300 per annum.

Necrology.—Dr. Hjalmar von Fellitzen, one of the leaders in agriculture and agricultural research in Sweden, died at Stockholm on March 7. He was especially active in the field of moor culture, so important in Sweden, but devoted his energies also to agriculture in general and to experiment station work in particular.

After graduating from the agricultural institute at Alnarp in 1892, he spent several years in Germany as a student of agricultural chemistry at Göttingen, and later as assistant at several German experiment stations, including the station at Darmstadt and the moor culture station at Bremen. Upon returning to his own country he took up work with the Swedish Moor Culture Association and soon advanced to the leadership of its activities, which he retained for nearly twenty years. During this period he established the moor culture experiment field at Flahult, an outstanding example of its kind, similar fields at Torestorp and Gisselås, and numerous smaller ones in different parts of the country. In 1921 he was called to the Central Institute and placed at the head of the agricultural division of that institution, a position which he held up to his death.

Dr. von Fellitzen was a prolific writer on agricultural questions pertaining to Sweden and the Scandinavian countries generally, and was recognized universally as an authority on the problems involved in the reclamation and economic management and utilization of peat and moor land areas.

New Journals.—*The Journal of the Central Bureau for Animal Husbandry and Dairying in India* is being issued as a quarterly by the Imperial Department of Agriculture in India, and deals with cattle breeding, dairying, cultivation and storage of fodder crops, animal nutrition, and other aspects of animal husbandry. The initial number contains a foreword by Lord Irwin, Viceroy and Governor General of India, and the following articles: Importance of the Cattle-Breeding and Dairying Industry in India, by W. Smith; The Introduction of Foreign Milk Stock into India for Cross-Breeding, by G. S. Henderson; A Veterinary Entomology for India, by T. B. Fletcher and S. K. Sen; Co-operative Dairying in Bengal, by W. Smith; The Rate of Propulsion of Food through the Alimentary Tract of Ruminants, by F. J. Warth; Poultry Breeding, by Mrs. A. K. Fawkes; Silage Experiments on Shisham Leaves, by P. E. Lander and B. B. Singh; The Influence of Roots and Other Feeding Stuffs on Milk Production, by R. H. B. Jesse; Minerals and Vitamins in Stock Feeding, by J. B. Orr; and Hints on the Management of Sheep in the Punjab, by R. Branford.

Physiological Zoölogy is being published by the University of Chicago as a quarterly of zoological research. It is intended primarily as a medium for the publication of results of research, but may include critical papers though not abstracts. Its distinctive field is defined as comprising the physiology of embryonic and reconstitucional development and of relation to environment in general, physiology of the cell and of protoplasm, physiology of the nervous

system and behavior in the stricter sense, hormones and other features of chemical correlation, sex in its physiological aspects, and the physiological phases of genetics. Among the articles in the initial number is one entitled *An Experimental Study of Ovarian Regeneration in Mice*, by H. O. Haterius.

Forestry, the journal of the Society of Foresters of Great Britain, is being published annually, with a possibility of additional issues. It is intended to provide a means for the publication of the results of practice and research both in the growing of timber and in its utilization, including forest physiology and ecology, forest soils, wood structure and timber physics, forest entomology, and forest mycology. The initial number contains numerous original articles and reviews along these lines.

Pineapple News is being issued monthly by the Experiment Station of the Association of Hawaiian Pineapple Cannerys, now located at the University of Hawaii, with some work carried on at the substation at Wahiawa and on lands of the various supporting companies. One of the early issues contains an account of the station's field experiments in progress and reports a method of isolating nematodes from the soil.

Boletim de Agricultura, Zootecnia e Veterinaria is being published by the secretary of agriculture of the State of Minas Geraes, Brazil. The initial issue contains an account of The Higher School of Agriculture and Veterinary Medicine of the State of Minas Geraes, by J. C. Bello Lisboa, vice director of the school, and several shorter articles, one of which is entitled *Returns from Some Corn Varieties*, by P. H. Rolfs, director of the school.

Boletín del Instituto Nacional de Investigaciones y Experiencias Agronómicas y Forestales is being published at Madrid. The initial number consists largely of a detailed account of the institute, established by a royal decree on October 22, 1926, and of the various research institutes in Spain and specific phases of their work.

Boletín Agrícola is being published monthly by the Section of Agriculture of the Republic of Panama. One of the early issues contains an account entitled *The Leaf-cutting Ant of Panama and Means of Control*, by A. Díaz G. and J. Zetek (E. S. R., 58, p. 264).

The Tea Quarterly is being issued as the journal of the Tea Research Institute of Ceylon. It contains both technical and popular material, the initial number presenting as its leading article the first of a series entitled *Tea and Soil Acidity*, by C. H. Gadd.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Laboratory manual of colloid chemistry, H. N. HOLMES (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., rewritten and enl., pp. XVIII+228, figs. 70*).—This is a second edition of a laboratory course in colloid chemistry, and includes with its experiments abundant discussion of the theory and principles involved. The subject matter is divided as follows: Suspensions—coarse and fine; dialysis, diffusion, and ultrafiltration; condensation methods of preparation; dispersion methods of preparation; electrical properties, electric osmose, and electrophoresis; coagulation or flocculation; protective colloids; surface tension—interfacial tension; emulsions; froths and films; solvated colloids or gels; soaps; the colloid chemistry of proteins; reactions in gels; viscosity and plasticity; adsorption from solution; adsorption from gases; aerosols; soils and clays; and special topics, including the ultramicroscope, etc.

The theory of emulsions and their technical treatment, W. CLAYTON (*London: J. & A. Churchill, 1928, 2. ed., pp. XI+283, pl. 1, figs. 41*).—This is the second edition of the *Theory of Emulsions and Emulsification* previously noted (*E. S. R.*, 49, p. 109). The present volume, brought up to date and enlarged in scope, has the following contents: Dilute emulsions as oil hydro-sols, emulsions and emulsifying agents, earlier theories of emulsions, adsorption at liquid/liquid interfaces, dual emulsions and the inversion of phases, the modern adsorption film theory, physical measurements in emulsions, emulsification, de-emulsification, some technical emulsions, theory of emulsions stabilized by solid particles (by W. Ramsden), emulsifying agents for preparing technical oil-water emulsions, and the separation of technical emulsions, particularly crude oil-field emulsions.

Methods of extracting volatile oils from plant material and the production of such oils in the United States, A. F. SIEVERS (*U. S. Dept. Agr., Tech. Bul. 16 (1928), pp. 36, figs. 16*).—This contribution from the Bureau of Plant Industry presents, following a brief introductory statement of the general nature and sources of volatile oils, a condensed account of methods of extraction, including solution (by volatile solvents, enfleurage, etc.), expression, and steam distillation, with notes on the advantages and disadvantages of each of these methods, the design and construction of experimental and commercial volatile oil stills and the operation of these, including the preparation of the material for distillation, the distillation proper, the disposal of waste, and the care and handling of the oil, general information on the production of volatile oils, both from wild and from cultivated plants, in the United States, and conditions to be considered in the growing of volatile oil plants.

Establishment of the optimal hydrogen-ion activities for the enzymic hydrolysis of starch by pancreatic and malt amylases under varied conditions of time and temperature. H. C. SHERMAN, M. L. CALDWELL, and M. ADAMS (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 8, pp. 2000-2005).—On the basis of experiments with amylases from these two sources in phosphate and in acetate buffer solutions at various H-ion concentrations and temperatures, the following observations are described:

Malt amylase has optima at H-ion activities varying with the temperature between 20 and 70° C. when acting in the presence of 0.06 M phosphate mixtures, but in 0.01 M acetate mixtures this amylase has the same optimum (pH 4.6 for 0.5-hour reaction periods and pH 4.8 for 2-hour periods) at 40 and at 60°. In the phosphate solutions the malt amylase did not show optima of H-ion concentration varying with the time applied for the reaction at temperatures between 30 and 60°. Potential measurements in the solutions, at room temperature and at the temperature of hydrolysis, and before and after hydrolysis showed that the different behavior of the malt amylase in phosphate and in acetate buffer mixtures was due to the influence neither of heat nor of the products of hydrolysis on the H-ion activities of the solutions themselves. In both phosphate and acetate mixtures the higher temperatures appeared to make malt amylase more sensitive to changes in H-ion concentration.

Pancreatic amylase was found to have an activity optimum at pH 7.0 to 7.2 in 0.5 to 2-hour reaction periods at temperatures of from 30 to 50°, but at 60° optima at pH 6.9 for 0.5-hour periods and at pH 6.7 for 2-hour periods were observed.

From the above noted variations the inferences are drawn that the factors upon which enzyme activity optima depend are interdependent to an extent even greater than has heretofore been recognized, and that no one of them is to be regarded as fixed when any one of the others is changed.

The chemistry of lignin.—I, Lignin from corn cobs, M. PHILLIPS (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 8, pp. 2037-2040).—This contribution from the color laboratory, Bureau of Chemistry and Soils, U. S., D. A., describes the preparation and examination of lignin from corncobs, with determinations of methoxyl groups and of hydroxyl groups capable of acetylation. This study of the corncob lignin led to the conclusion that apparently lignin is a fairly homogeneous substance or a mixture of closely related isomers. All the results were found to agree closely with the formula $C_{40}H_{40}O_{12}$ for lignin from this source. The molecule was found to contain four hydroxyl groups capable of acetylation, together with three methoxyl groups. These results are considered in close agreement with those obtained by various investigators on lignins from other sources.

The nature of active nitrogen: The synthesis of ammonia from the elements, B. LEWIS (*Jour. Amer. Chem. Soc.*, 50 (1928), No. 1, pp. 27-35, fig. 1).—A report is made of experiments on the interaction of active (glowing) nitrogen from an electrodeless discharge and atomic hydrogen from a Wood's discharge tube. Ammonia was formed only when both gases had been activated, no hydrazine having been found under any conditions. Glowing active nitrogen appears to be a nonhomogeneous mixture of atomic nitrogen and excited nitrogen molecules.

Investigations with grape pigments (*New York State Sta. Rpt.* 1927, p. 50).—A large quantity of the pigment of Ives grapes was prepared, the product proving very hard to purify. It appeared, however, to contain both mono- and dimethyl delphinidins, together with some other anthocyan pigment yielding parahydroxy cinnamic acid as a decomposition product.

A micro method for the determination of surface tension and density, V. R. DAMERELL (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 12, pp. 2988-2991).—A micro method and apparatus for determination of surface tension and density with an accuracy of from 1 to one-third of 1 per cent are described in this contribution from the chemistry department of the University of Washington. Not over 0.1 cc. of the sample is required for both determinations. The same apparatus, with the addition for the density determinations of a jacket, serves for both determinations.

The application of the electron tube to potentiometric titrations, J. W. WILLIAMS and T. A. WHITENACK (*Jour. Phys. Chem.*, 31 (1927), No. 4, pp. 519-524, figs. 3).—A circuit for the use of a 3-element radio tube, the value of which as a practical electrostatic voltmeter for electrometric titrations is stated to have been first noted by Goode (*E. S. R.*, 47, p. 204), is illustrated in the accompanying diagram, and may be described as follows:

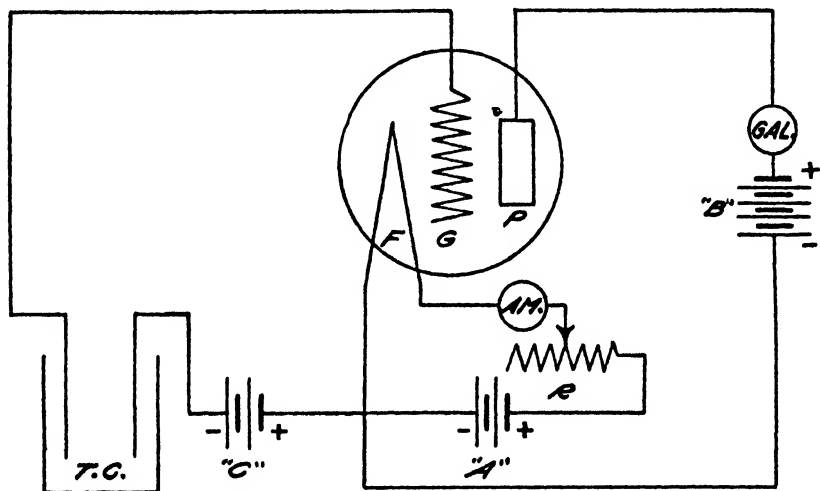


FIG. 1.—A circuit for use in electrometric titrations

The grid, *G*, of a CX-299 or similar tube is connected to a plain platinum wire indicator electrode, shown at the left in the titration cell *T. C.* The second, or reference electrode, in *T. C.*—a calomel electrode—is connected to the negative terminal of the battery "*C*," one or two dry cells, the positive terminal of "*C*" being connected to the negative side of the filament heating circuit, while the same point is also connected, as shown, through the "*B*" battery, 22.5 volts, and through a wall galvanometer to the plate, *P*, of the tube. The "*A*" or filament heating battery has a rheostat, *R*, and an ammeter between its positive terminal and the positive side of the filament, *F*. The filament of the tube used in the experiments here described was designed for operation at 3 volts pressure and a current of 0.06 ampere, but was found to work best for the present purpose at 0.04 ampere.

The mid point of the inflection of the curve galvanometer deflection plotted against cubic centimeters of the titrant gives the end point of the titration. Constant filament current is to be secured before beginning the titration.

Good end points were secured in the following titrations: (1) Oxidation-reduction reactions: Potassium bichromate against ferrous ammonium sulfate; permanganate against a manganous salt; and iodine against thiosulfate; (2)

precipitation reactions: Zinc salts against potassium ferrocyanide; and (3) neutralization reactions: Acetic acid and potassium hydroxide.

Improved apparatus for the removal of dissolved gases from water, J. R. LORAH, K. T. WILLIAMS, and T. G. THOMPSON (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 12, pp. 2991-2994, fig. 1).—The apparatus noted in this contribution from the department of chemistry, University of Washington, is described as combining the more desirable features of the Van Slyke design (*E. S. R.*, 37, p. 804) with those assembled from other devices for the same purpose. It is considered to be adaptable to any size of system or quantity of gas, to provide means for the sharp separation of water from the gas, and to have the minimum number of joints consistent with ease of manipulation, and it has a seal for each joint.

A simple colorimeter, R. C. FREDERICK (*Analyst*, 52 (1927), No. 617, pp. 469, 470).—The comparison vessels of this instrument are formed by attaching colorless glass discs to colorless graduated tubes, provided with side tubes near the base, by means of a suitable adhesive. Reservoirs are connected to the side tubes with rubber tubing. Light is reflected up through the tubes by a mirror of adjustable angle, and the color images are observed in an upper mirror. Simple coarse and fine adjustments for the heights of the reservoirs are also provided.

Direct Nesslerization of Kjeldahl digestions, H. M. CHILES (*Jour. Amer. Chem. Soc.*, 50 (1928), No. 1, pp. 217-221).—By the use of a protective colloid to prevent the precipitation of the color in Nesslerized solutions, it was found possible to determine the ammonia in any of the commonly used Kjeldahl digestion mixtures, concentrations up to 20 mg. of nitrogen in 100 cc. of final solution having been accurately determined by the use of a specially prepared gum arabic solution as a protective colloid in the presence of from 5 to 8 gm. of sodium or potassium sulfate. These solutions were found to develop their maximum color rapidly and to show no precipitation for some time. Satisfactory determinations were shown to be possible even in solutions saturated with sodium sulfate. Since ordinary gum arabic contains both ammonia and substances capable of reducing Nessler's solution, however, it was found necessary to purify the gum by dispersing a 10-gm. portion in 190 cc. of ammonia-free water and adding 4 gm. of Permutit powder, shaking at intervals for 10 minutes. The purified solution is decanted after the insoluble matter has had time to settle out. If this solution shows reducing action with Nessler's reagent, it is treated with about 0.1 its volume of Nessler's solution, allowed to stand until clear, and decanted for use. It is considered that the limit of accuracy of this method is only that of the accuracy of the colorimetric readings.

Influence of sulfates on the volumetric method for the determination of phosphorus, C. M. BIBLE (*Jour. Assoc. Off. Agr. Chem.*, 11 (1928), No. 1, pp. 126-128).—The official volumetric method for phosphoric anhydride (*E. S. R.*, 55, p. 11) in phosphate rock, etc., was found to give results from a little over 1 to 2 per cent too high in a sulfate-free sample of phosphate rock when sulfate was added in the form either of ammonium sulfate to the extent of 2 gm. of the sulfate to 1 gm. of the sample, or of the same proportion of ammonium sulfate with the addition of a digestion with sulfuric and nitric acids and sodium nitrate. A table presenting the results of various forms of the phosphomolybdate precipitation in the presence and in the absence of added sulfate shows figures as high as 36.45 per cent of phosphoric anhydride for a sample known to contain 34.45 per cent, digested with nitric and sulfuric acids in the presence of twice its weight of ammonium sulfate. This disturbing effect of sulfates demands a careful standardization of conditions, especially the temperature of the

preparation of ammonium phosphomolybdate, but it does not render the securing of accurate results for the volumetric method impossible or difficult, in the author's opinion. The following procedure is recommended:

Transfer the aliquot of the phosphate to a beaker containing 50 cc. of 30 per cent ammonium nitrate solution, neutralize with ammonia, make just acid with nitric acid, and heat the solution to 45° C.; but remove from the heating bath just before heating the ammonium molybdate. Do not heat after the addition of ammonium molybdate but stir at room temperature for 30 minutes. The remainder of the official procedure is not modified.

Some observations on the washing of gluten from flour, D. W. KENT-JONES and C. W. HERD (*Analyst*, 52 (1927), No. 617, pp. 439-443).—Comparative tests of the gluten washing method of flour testing were carried out by nine operators, including the authors, other chemists, and a miller; eight flours were examined, and the two procedures of washing with water and washing with Dill and Alsberg's special solution (*E. S. R.*, 53, p. 105) were tried by each operator with each sample. The results, which are presented in three tables giving gluten percentages, nitrogen percentages in the glutes, and gluten-nitrogen ratios, respectively, led to the conclusion that the use of a special solution, such as that of Dill and Alsberg above cited, does not eliminate the errors inherent in gluten determinations. Even with apparently identical details of method, there are personal differences in the manipulation of the dough and gluten which cause large variations in the results. Tests show, however, that each operator gets essentially consistent results, this being considered to indicate that the ratio between the nitrogen of the flour and the dried gluten is practically constant for each operator.

A numerical expression for the colour of flour, D. W. KENT-JONES and C. W. HERD (*Analyst*, 52 (1927), No. 617, pp. 445-452, figs. 2).—In a brief discussion of methods previously used for judging the color values of flour, it is noted that the gasoline value of the Association of Official Agricultural Chemists (*E. S. R.*, 55, p. 11) gives good results in the determination of the yellow color due to carotin, but takes no account of the reddish brown pigment of the bran particles; and it is said to be generally admitted that the Lovibond tintometer is not satisfactory for flour work. Full information on the color of a flour, it is concluded, must include accurate estimations of both of these colors, and a procedure, of which the following is a much abbreviated statement, is proposed as satisfactory for this purpose.

Bran pigment.—Treat 20 gm. of the flour with 50 cc. of water in a wide mouthed glass-stoppered bottle, mix thoroughly, add 5 cc. of normal sodium hydroxide, again mix well, and allow to stand 1 hour, shaking once each 10 minutes. Add 100 cc. of methyl alcohol and shake overnight (16 hours). Precipitate the glutenin by adding $N/5$ hydrochloric acid to pH 6.4, bromthymol blue as external indicator. After 1 hour centrifuge and filter. Add 1 cc. of the sodium hydroxide solution to 50 cc. of the filtrate, and compare the color of this 51 cc. solution in a Nessler tube placed in a special colorimeter (for details of the construction of this instrument the figure and description in the original article must be consulted) against a standard color solution of 5 cc. of 0.5 per cent potassium chromate and 2 cc. of 10 per cent anhydrous cobalt nitrate solution made up to 100 cc.

Carotin pigment.—Shake 20 gm. of the flour with 100 cc. of gasoline in a glass-stoppered 8-oz. bottle at intervals for 15 minutes and let stand overnight. Filter, avoiding evaporation, and compare as in the case of the bran pigment, using a standard solution of 10 cc. of the chromate solution and 1.5 cc. of the cobalt nitrate solution made up to 100 cc. with water.

Report the determinations as cubic centimeters of the respective standards required to match 50 cc. of the extract.

Determination of chlorine in bleached flour, A. SEIDENBERG (*Jour. Assoc. Off. Agr. Chem.*, 11 (1928), No. 1, pp. 132-135).—The method quoted below is described as capable of duplications on the same sample to within six or seven parts per million. On account of the probability of the presence of traces of chlorine in even the best grades of sodium hydroxide, it is recommended that the alcoholic sodium hydroxide reagent for the proposed method be prepared from 95 per cent ethanol and metallic sodium, the metal being obtainable free from chlorine. Forty grams of sodium are to be dissolved in 1,000 gm. of 95 per cent ethanol for the preparation of this reagent.

"Weigh 20 gm. of flour into a 500 cc. Erlenmeyer flask, add 60 cc. of 70 per cent ethanol, place the flask upon a steam bath, and heat gently (water should steam but not boil), at the same time rotating the flask until the flour and liquid form a uniform mixture. Add 60 per cent of 95 per cent ethanol. Stopper the flask and shake thoroughly for 2 minutes. Allow to cool. Add 75 cc. of ethyl ether and shake the flask thoroughly, then add 150 cc. of petroleum ether and again shake the flask thoroughly. Pour the entire liquid contents into a separatory funnel, being careful to avoid, as far as possible, transference of any flour particles.

"Add to the flask containing the flour 40 cc. of petroleum ether, shake thoroughly, and pour into the separatory funnel. Repeat with another 40 cc. portion of petroleum ether. Wash the solvents twice with water, using 30 cc. of water the first time and 10-12 cc. the second time; shake thoroughly each time, and allow to stand until two sharply defined layers of liquid are formed. Run the washed solvents into a large evaporating dish (or beaker), add 10 cc. of the alcoholic soda solution, and evaporate to about 10-15 cc. Pour this liquid into a 50 cc. platinum dish and wash out the evaporating dish with small portions of 95 per cent ethanol until all the liquid and residue have been transferred to the platinum dish. Evaporate the contents of the dish to dryness on the steam bath and place the dish with the residue over a small yellow flame of a Bunsen burner. Char the residue but do not heat even to low redness, because the alkali may react with the platinum. Allow to cool and add a small quantity of water and 5 cc. of 1:3 nitric acid. Boil, and then pour through an ashless filter paper (12.5 cm. in diameter), catching the filtrate in a sugar flask calibrated at 100 cc. and 110 cc. Again boil residue with a small quantity of water and filter. Remove the filter paper, fold once, and place in platinum dish, and heat to low redness until practically all of the paper and residue have been reduced to a gray ash. (Only a low heat may be used owing to the presence of chlorides.) Add a small quantity of water and 2.5 cc. of nitric acid, boil, and filter. Again boil once or twice with small quantities of water, filtering as before.

"Add to the liquid in the sugar flask 25 cc. of 0.005 N silver nitrate solution, add water to bring the liquid approximately to the 100 cc. mark, and place the flask in boiling water for about 5 minutes. Remove, and allow to cool to room temperature. Bring the liquid exactly to the 110 cc. mark by adding water, stopper the flask, and mix the contents well. Filter through a dry, fine-pore filter paper (12.5 cm. in diameter), and return the first portion of the filtrate to the original solution. Continue to refilter until the filtrate is entirely clear, and thus secure 100 cc. of filtrate. Transfer the entire 100 cc. to a white porcelain casserole, add 2 cc. of ferric-ammonium alum solution, and titrate with 0.005 N potassium thiocyanate until a permanent light brown coloration appears. Deduct the blank determined on all the reagents used and calculate results to the dry basis."

Method for estimating field corn in canned mixtures of field and sweet corn, J. I. HEID (*Jour. Assoc. Off. Agr. Chem.*, 11 (1928), No. 1, pp. 136-138).—The method described depends on the presence in sweet corn kernels of erythrodextrin and the absence of iodine-stained carbohydrates other than starch in the case of field corn kernels. All kernel fragments retaining the seed coat are mixed and quartered down to about 400 pieces, hardened with alcohol, and again quartered to subdivisions of about 100 pieces. These pieces are cut through, and fragments of a diameter of about 1/16 in. are taken from the centers of the pieces and placed in separate depressions on a spot tile. A 0.2 per cent solution of iodine in 1.5 per cent aqueous potassium iodide causes a dense brown cloud to spread from the sweet corn kernel fragments while the solution remains clear about the field corn kernel fragments, the fragments themselves staining a sharp blue-black in the latter case.

The data presented show some of the collaborators to have estimated the field corn content in packs contaminated with 50, 25, 10, and 5 per cent additions and in another group of packs containing 10, 20, 40, and 50 per cent additions with considerable accuracy, while a smaller number obtained widely discrepant results. The author ascribes the serious discrepancies to difficulty in securing uniform samples rather than to inaccuracies in the interpretation of the results, and considers that this examination of authentic packs indicates that the method has value in the detection of the intentional adulteration of canned sweet corn with field corn.

The undetermined chemical losses of sugar in the refining process, I-VII [trans. title], M. I. NAKHMANOVICH (*Nauch. Zap. Gosud. Eksper. Inst. Sakh. Promysh.* [Kiev], 4 (1927), Nos. 8, pp. 267-274; 9, pp. 291-298; 10, pp. 323-334, fig. 1; pp. 339-346, fig. 1; 11, pp. 347-354, fig. 1; pp. 358-366; 12, pp. 396-416).—This is a series of seven articles on sugar refining, of which the sixth deals with the losses which occur in the cooking of the products. The author shows that the processes of change in the products of the refining industry which take place during heating increase with the increase in temperature from 80 to 100° C. The products which approach the composition of pure sugar solutions withstand the temperature of 80° for 12 hours without undergoing any change, but when kept at 100° there is considerable change. The lower quality products of the refining industry undergo a change even at 80°. A number of reducing substances are formed. The method for determining the change is the determination of the organic nonsaccharine substances. The losses may be as high as from 0.12 to 0.17 per cent.

A method for determining the tensile strength of gelatin jellies, A. ROSINGER and J. J. VETTER (*Jour. Amer. Chem. Soc.*, 49 (1927), No. 12, pp. 2994-3003, figs. 9).—A method for the study of the elastic properties of gelatin jellies and of other elastic materials capable of membrane formation is described, together with a form of the necessary apparatus. The procedure depends upon the static loading of jelly membranes, and is based upon the assumption of a spherical form by the circular elastic membrane supported rigidly at its circumference and subjected to air pressure on one side. The derivation of the equations involved in the behavior of such a system is briefly dealt with. The construction and manipulation of the apparatus are described, and data from experiments with jellies of various concentrations of a number of gelatins are presented in graphic and tabular form, together with figures showing the effect on gelatin jellies of chrome alum and of formaldehyde. It is noted that the apparatus can be applied also to the study of the time of relaxation of stretched membranes.

Effect of polarized light on the pharmacological properties of some drugs, D. I. MACHT and W. T. ANDERSON, JR. (*Jour. Amer. Chem. Soc.*, 49

(1927), No. 8, pp. 2017-2034).—Experiments on the comparative rates of deterioration under exposure to ordinary and to plain polarized light of a number of drugs, especially digitalis tincture and cocaine and quinine solutions, are reported. The irradiation was made with light polarized by Nicol prisms and by piles of glass plates, controls with light of exactly the same nature except for the polarization having been run at the same time. It was found that the deteriorating effect of the polarized light was distinctly greater than that of ordinary light. Attention is called to the fact that paper, the walls of glass containers, reflecting surfaces, and other agencies may polarize light which reaches drug products to an appreciable extent.

METEOROLOGY

Weather and corn maturity in Iowa, C. D. REED (*U. S. Mo. Weather Rev.*, 55 (1927), No. 11, pp. 485-488, figs. 5).—The author states that there was a well defined tendency during the period 1890-1926 for corn in Iowa to become more and more damaged by frost before it reached maturity. He reports a study of causes which indicates that this tendency was positively correlated in descending order with "(1) breeding for increased yield; (2) decrease in available phosphorus in the soil; (3) later planting due to later frost date and other unfavorable weather conditions. Slight but inappreciable tendencies that should have operated in the direction of improved maturity have been: (1) Later autumn frosts; (2) upward trend in seasonal temperature and also in the temperature of the month of May." It is suggested that "all weather tendencies will probably disappear when a sufficient length of record has accumulated."

November floods in New England and eastern New York, H. C. FRANK-ENFIELD (*U. S. Mo. Weather Rev.*, 55 (1927), No. 11, pp. 496-499, figs. 2).—A brief account is given of the weather conditions preceding and accompanying these floods and of the damage caused by them. The torrential rains responsible for the floods had their inception in "an exceptionally strong pressure gradient for southeast to east surface winds over New England and the Hudson River Valley. . . . These winds from off the sea were high in moisture content and heavy rains naturally resulted." The severity of the floods was increased by excessive rainfall during the preceding October. The floods were responsible for the loss of 88 human lives and for property damage estimated to have been at least \$32,600,000, Vermont being the greatest sufferer, but other New England States and adjacent parts of New York were seriously involved.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. BAUMGARTNER (*Massachusetts Sta. Met. Buls.* 469-470 (1928), pp. 4 each).—The usual summaries and notes are given of observations at Amherst, Mass., during January and February, 1928.

Weather conditions and crops, C. G. SELVIG and A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpts.* 1926, pp. 6-9; 1927, pp. 5-7).—Weather and crop conditions at the Northwest Experiment Station, Crookston, Minn., during 1926 are briefly reviewed by Selvig, with tables giving data on temperature and precipitation for 1924-1926 and dates of killing frost, 1897-1926. Corresponding data for 1927 are reported by Dowell.

The average temperature of 1926 was 39.8° and for 1927 38.1° F., as compared with the 10-year normals of 39.3° and 39.2°. The total precipitation for 1926 was 13.99 and for 1927 20.94 in., as compared with the normals of 18.05 and 19.07 in. The frost-free growing period of 1926 extended from May 22 to September 12, and that of 1927 from May 15 to September 25, the

average dates for the 31-year period, 1897-1927, being May 19 and September 22, respectively.

The weather of 1927 in the United States, A. J. HENRY (*U. S. Mo. Weather Rev.*, 55 (1927), No. 12, pp. 530, 531, pls. 2).—Monthly and annual departures of temperature and precipitation from the normal during the year in different sections of the country are shown graphically and in tables.

It is stated that "the year as a whole was a warm one in practically all parts of the country." The data for precipitation appear to be "at variance with the very general impression that the early part of the year, at least, was unusually wet in the Mississippi Basin. . . . The Atlantic Coast States and the East Gulf States had greatly reduced rainfall in the great majority of months of 1927, one great rainstorm in western New England in November being an exception. The year was rather rich in calamitous events due to atmospheric phenomena; a single tornadic storm swept through a closely built up section of St. Louis, Mo., causing a large number of deaths and injuries and a vast property loss. Two calamitous floods, one in the Mississippi Basin, the other in western New England, completed the record of the year. While unfavorable weather at times was harmful to crops, favorable weather later in the season made up the damage and the final result was a crop yield above the 10-year average."

Report of the chief of the Weather Bureau, 1926-27 (*U. S. Dept. Agr., Weather Bur. Rpt. 1927*, pp. III+260, pls. 7).—This report gives a general summary of weather conditions of each month of the year, monthly amounts of sunshine at 163 stations, details of excessive precipitation during the year, and tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

Outstanding features of the weather of the year were the West Indian hurricane which passed over Florida and other Southern States in September, entailing a loss of nearly 250 lives and property damage estimated at approximately \$100,000,000 and a severe cold wave in September in the northern Plateau and the upper Mississippi Valley. During the first 7 months of the year there was "a widespread deficiency of precipitation, particularly in the middle and northern districts. The last 5 months, however, had mainly more than normal precipitation over many of the same districts, and also over large areas to the southward, particularly in the lower Mississippi Valley and far Southwest. Only 2 years of the last 15 have averaged wetter in Oklahoma and Florida, while in Michigan it was the wettest year among the last 10. However, the Carolinas experienced a very dry year, though not so dry as 1925. In Montana and the Dakotas the year was among the driest of record."

Monthly Weather Review, [November-December, 1927] (*U. S. Mo. Weather Rev.*, 55 (1927), Nos. 11, pp. 485-518, pls. 10, figs. 10; 12, pp. 519-554, pls. 13, figs. 10).—In addition to detailed summaries of meteorological and climatological data and weather conditions for November and December, 1927, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 11.—Weather and Corn Maturity in Iowa (illus.), by C. D. Reed (pp. 485-488) (see p. 808); Some Results Obtained by Testing Solarimeters with Pyrheliometric Tubes (illus.), by L. Gorczyński (pp. 488-490); On the Unit of Radiation, by N. Shaw (pp. 491, 492); Meteorological Aspects of the International Balloon Race from Detroit, Mich., September 10, 1927 (illus.) (pp. 493, 494), and An Example of Widespread Bumpiness in the Air (pp. 494, 495), both by C. G. Andrus; The Growth of the Northeastward-Moving Cyclone in Eastern North America (p. 495), and The Greater Increase in Size and Intensity of the

Extratropical Cyclone by Night Than by Day (p. 496), both by W. J. Humphreys; November Floods in New England and Eastern New York (illus.), by H. C. Frankenfield (pp. 496-499) (see p. 808); and The Virginia-District of Columbia-Maryland Tornado of November 17, 1927 (p. 499), and Waterspout in the Potomac River, Washington, D. C., November 17, 1927 (p. 499), both by W. E. Hurd.

No. 12.—Winds and Storms on the Isthmus of Panama (illus.), by L. T. Chapel (pp. 519-530), and The Weather of 1927 in the United States (illus.), by A. J. Henry (pp. 530, 531) (see p. 809).

SOILS—FERTILIZERS

A new soil sampler, A. KOPP (*Soil Sci.*, 25 (1928), No. 3, pp. 236, 237).—The instrument consists essentially of a steel tube 5 cm. in diameter with 2.5-mm. walls beveled at the lower end. Two pieces of smaller pipe, constituting a T-piece handle, are welded to the sides of the main tube apparently about 10 cm. from the top. At 4 cm. from the top two diametrically opposite catches or pins are also welded in. A bronze head fitting over the top of the tube and lined with hardwood, antifriction metal, or the like, to protect the top of the tube when the instrument is struck into the soil, is also provided, together with a second cap carrying a screw piston and held in place by cuts engaging the catches or pins. A detachable wrench serves to turn this expelling screw. Cores of a depth of 1 meter may be taken, the layers remaining undisturbed though the cores are said to be somewhat stiffened.

Soil survey of Polk County, Oregon, E. F. TORGERSON ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1922, pp. III+1681-1721, pls. 3, fig. 1, map 1).—Polk County comprises an area of 476,160 acres, varying in topography from stream valleys and bench lands in its eastern part to rough, mountainous, and heavily forested country in its western portion, in north-western Oregon; the elevation varying from 20 to 300 ft., while drainage is supplied by several rivers.

This survey, made in cooperation with the Oregon Experiment Station, maps and describes 23 soil types in 16 series, the most extensive single type being Melbourne clay loam, which covers but 7.3 per cent of the total area of the county. Rough mountainous land, unclassified, occupies 43.5 per cent.

The soils of Bowie, Denton, Freestone, and Red River Counties, G. S. FRAPS (*Texas Sta. Bul.* 375 (1928), pp. 48, fig. 1).—Determinations of total phosphoric acid, active phosphoric acid, total potash, acid-soluble potash, active potash, total nitrogen, acid-soluble lime, "basicity," acidity, and corn possibility in both the surface and subsurface soils of the forested and prairie uplands, second bottom or terrace, and first bottom soils of the four counties were made, and are here reported along lines previously noted (*E. S. R.*, 55, p. 116) together with more or less detailed descriptions of the groups, noted both as such and as series, found in each of the four counties, and a discussion of the fertility of these soils, including suggested methods for fertility maintenance. Soil surveys for these counties have been noted (*E. S. R.*, 46, pp. 18, 119; 48, p. 211; 49, p. 416).

A study of commercial varieties of dry peat molds [trans. title], G. KEPPELER and H. HOFFMANN (*Jahrb. Moork.*, 14 (1925-1926), No. 1, pp. 12-21).—The moisture content, ash volume weight, kernel size, total acid content, H-ion concentration, and degree of decomposition are reported for a number of samples, and the relation between the degree of decomposition and the other properties determined is discussed.

Soil temperatures in Saskatchewan, E. I. HARRINGTON (*Soil Sci.*, 25 (1928), No. 3, pp. 183-194, figs. 5).—This contribution from the University of Saskatchewan reports soil temperature measurements taken with special precaution to secure natural soil conditions at depths of from 1 to 8 ft., inclusive. Electrical resistance thermometers, tested before placement and found highly accurate, were placed in horizontal 2-ft. borings driven from the side of a main hole 8 ft. deep and just large enough to permit the necessary work. After the placing of each thermometer, protected with waterproof lead sheathing, the horizontal bore was refilled with the same soil that had been taken from it, the soil taken from the main hole was also replaced and tamped, and the entire installation was left in place for two years before the observations here recorded were made.

At the 8-ft. depth the temperatures appeared entirely unaffected by the daily fluctuations at the surface, and during the year covered by the experiments had a range of from 49.3 to 34.2° F. only. For a 3-month period, beginning early in March, the temperature at this depth remained within 1° of 35°, whereas the air temperature during the period varied more than 80°. At the 1-ft. depth, summer changes in atmospheric temperature were found to be followed by similar changes 1 day later. Similar variations, though of less degree, were noted at the 2-ft. level, but with an additional lag proportional to the increased depth. Below the 3-ft. level the effects of daily atmospheric fluctuations were difficult to identify, and only the most marked variations were detected as low as the 5-ft. level. Under snow the lag at the 1-ft. level was much greater than in summer.

It is noted that the curves illustrate the soil temperature "overtun," the temperature at the 1-ft. level being above that at the 2-ft. level for the period from April 14 to October 10, while for the rest of the year the lower level had the higher temperature.

The volume weight of soils as a physical characteristic of the soil profile, A. F. LEBEDEV (*Soil Sci.*, 25 (1928), No. 3, pp. 207-211, figs. 3).—Though methods for the determination of the volume weight, defined as the weight of a unit volume of soil of undisturbed structure dried at 105 to 110° C., are given in textbooks on soils, it is considered to be much less used either in the description of soil profiles or in the study of soil process dynamics than it should be. Among reasons advanced for this view of the importance of the determination of the volume weight of soils are (1) that the change in volume weight is in itself a supplementary physical characteristic for each of the various horizons of the soil profile, (2) that this determination furnishes information with respect to the translocation of soil substances from one horizon to another during the development of the soil, and (3) that the volume weights in the soil profile, combined with the chemical analyses, give an accurate picture of the nutrient resources of the individual horizons as well as of the profile as a whole.

Comparative data on the volume weight of an Odessa and a Rostov soil, determined at 5-cm. intervals to a total depth of 200 cm., are presented with a discussion of their significance, and a method for the determination under consideration is described as follows:

The sampling instrument consists of a thin-walled steel tube 15 cm. in length and 4 cm. in diameter, with edges sharpened at the end designed to enter the soil, and provided with openings in the side of the tube permitting the cutting off with a knife introduced through them of a cylinder of soil of exactly 2 cm. depth. The sample is taken by inserting the instrument, without turning, into the wall of the soil cut at a depth of 2.5 cm. The soil is cut around the

outer side of the tube at an angle so that a conical surplus projects from the cutting end of the instrument. This surplus is carefully cut off with a sharp knife after removing the instrument from the soil so that the surface will be even with the cutting edge of the tube, the inner end of the 2-cm. cylinder of soil being similarly planed through the windows provided in the tube. The dry weight of the resulting cylinder of soil of undisturbed structure is determined and the volume weight calculated from this figure, together with the known volume determined by the construction of the sampler.

The physical and biological effects of high-frequency sound waves of great intensity, R. W. WOOD and A. L. LOOMIS (*Phil. Mag. and Jour. Sci.*, 7. ser., 4 (1927), No. 22, pp. 417-436, figs. 4).—Among descriptions of numerous startling effects producible by "supersonic" vibrations, set up by means of an oscillating quartz crystal in an oil bath, is a very brief note on the dispersion into water of the colloids of a soil sample furnished the authors by the U. S. D. A. Bureau of Chemistry and Soils, the sample having been described as "very difficult" to disperse. Dispersion was complete after a few minutes' exposure to the high-frequency sound vibrations. A detailed description of the apparatus is given.

The effect of dehydration of soils upon their colloid constituents, II, J. L. STEENKAMP (*Soil Sci.*, 25 (1928), No. 3, pp. 239-251, figs. 2).—Continuing the physicochemical study reported in part 1 (*E. S. R.*, 58, p. 614), the author describes experiments to determine the effect of drying by heat and by exposure to dry atmospheres of air and of pure oxygen, nitrogen, hydrogen, and carbon dioxide upon both neutral salt-forming and acid salt-forming bases in several soils. The determinations were carried out at various stages of dehydration by treating samples of approximately 20 gm. of the soil with 200 cc. of $N/10$ hydrochloric acid, shaking mechanically for 3 hours and occasionally by hand for 24 hours, after which the mixtures were titrated with standard alkali to the end points indicated by methyl red and by phenolphthalein. The difference between the two end points was taken as the titer of the acid salt-forming bases. In addition to tabulations of the data obtained, graphs showing the intersection points of curves of the exchangeable bases and of the acid salt-forming bases, both plotted to the same scale against the moisture content, are presented, these intersections being considered as indicating a water content below which soluble nutrients will be set free. Other significances of the observations recorded are discussed at some length.

The absorption of rain water during vegetation by the soil and its utilization by plants, N. TULAIKOV and A. KOZHEVNIKOV (*Soil Sci.*, 25 (1928), No. 3, pp. 213-224).—This is a translation by J. S. Joffe of the New Jersey Experiment Stations of a contribution from the Saratov Regional Experiment Stations, Russia. Determinations of soil moisture at various depths made at frequent intervals during the growth period of the crops and changes in the soil moisture content in relation to originally available moisture are reported for plats under winter rye, spring wheat, sunflower, and under fallow, together with the relative humidity, average daily temperature, and rainfall for a part of April and for May, June, July, and August, 1926, the period covered by crop growth in the plats studied. These data are discussed at some length, and numerous conclusions are presented.

The actual acidity of the podsol soils and the influence of liming [trans. title], N. REMEZOV (N. P. REMESOW) (*Trudy Nauch. Inst. Udobr. (Trans. Sol. Inst. Fert. [Moscow])*, No. 42 (1927), pp. 26, figs. 12; *Eng. abs.*, p. 26).—It is suggested that while the method of obtaining the soil solution by displacement with alcohol is, in the author's opinion, the most convenient procedure, it

destroys the soil structure and so may cause loss of carbonic acid. The combination of two methods, attributed to Schlösing and Hemmerling, was compared with the alcohol displacement method, but with no observed difference in results in the range, pH 6.0 to pH 7.5. At higher acidities the author's method is said to give results consistently accurate to 0.2 pH.

The actual acidity was found to be not permanent but variable under the influence of meteorological and biological factors. In fallow soil the acidity was higher than in the soil with a plant cover. In the unplowed fields the observed acidity showed an increase parallel with the nitrate increase, but in the plowed fields the opposite was found to be true. Increasing soil moisture was found to tend toward increased acidity, but when the soil moisture exceeded 30 per cent leaching was found to be possible with an actual acidity then approaching the neutral point.

Diagrams showing the soil acidity of a field at various periods in the year 1924-25 are appended. These are considered to show conclusively that such acidity maps can not be made up on the basis of a single determination because of variations in the soil acidity brought about by the vegetation and by changes in the meteorological conditions.

Fluorescein dyes as bacterial stains, with special reference to their use for soil preparations. H. J. CONN and W. C. HOLMES (*Stain Technol.*, 1 (1926), No. 3, pp. 87-95).—This contribution from the New York State Experiment Station and the color laboratory, U. S. D. A. Bureau of Chemistry and Soils, is a further study of the fluorescein and rose bengal stains proposed by the senior author for the staining of soil bacteria and other bacterial forms. A total of 13 members of the group of halogenated fluoresceins was included in the present investigation, their color, constitution, comparative acidity, and their staining properties for soil bacteria, both in pure culture and in the soil itself, being noted. In general the staining effectiveness improved with increasing depth (passage from the yellower to the redder shades) of color and with decreasing fluorescence and acidity. Erythrosin B and phloxine B, however, both comparatively acid stains, were fairly effective. A further desideratum, noted as important in soil staining, is full staining of the bacteria without coloration of the dead organic matter.

Two tetrachloro fluoresceins and an octachloro fluorescein were found to be of little value either for pure cultures of soil bacteria or for these organisms in the soil itself, and 3', 4', 5', 6'-tetrabromo fluorescein was little if any better; 2, 4, 5, 7-tetrabromo fluorescein, familiar as eosin Y (Color Index No. 768), was better than the preceding, but too light in color for satisfactory results with either pure culture or soil infusion bacteria. Several other unsatisfactory fluorescein derivatives are described. However, 3', 6'-dichloro-2, 4, 5, 7-tetrabromo fluorescein or phloxine (C. I. No. 774) proved a very good stain for pure culture and comparatively good for soil infusion, while 3', 4', 5', 6'-tetrachloro-2, 4, 5, 7-tetrabromo fluorescein or phloxine B (C. I. No. 778) proved better, especially for a soil infusion, than the preceding. Likewise, 3', 4', 5', 6'-tetrachloro-2, 4, 5, 7-tetraiodo fluorescein or rose bengal B (C. I. No. 779) "proves a splendid bacterial stain either in pure culture or in soil infusions," and is regarded as the most satisfactory of these stains.

An improved stain for bacteria in soil. H. J. CONN (*Stain Technol.*, 1 (1926), No. 4, pp. 125-128).—Continuing the study of the staining of bacteria in soil suspensions, above noted, the author first established the importance of the reaction of the treatment immediately preceding staining with respect to the effectiveness of the halogenated fluorescein dyes by experimental pretreatment of the dried smears with buffer solutions having pH values of 4, 6, 8, and 9.5.

Among the results of these experiments was the observation that rose bengal (C. I. No. 779) stained well after treatment at pH 4, fairly well after treatment at pH 6, but very poorly after either of the more alkaline buffer solutions, whereas erythrosin (either yellowish or blueish) stained best after pretreatment at pH 8 or 9.5 and very poorly after a pH 4 buffer mixture, phloxine B behaving much like erythrosin but coloring the dead organic matter too deeply in any case. The following technique was then elaborated:

Make a soil suspension in 9 times its weight of 0.015 per cent gelatine solution. Smear a drop of this in a thin film on a slide. Immerse for from 1 to 3 minutes in a 40 per cent solution of acetic acid or a N/10 solution of hydrochloric acid. Wash off the excess acid briefly and dry on a flat surface over a boiling water bath. While still on the water bath cover the film with a 1 per cent aqueous solution of rose bengal, phloxine B, or erythrosin Y, and allow it to stain for about 1 minute.

"Using 40 per cent acetic acid for treating the soil smears before staining, the results were unexpectedly fine. The bacteria stood out more sharply than in any preparation ever before examined. The same soil that had been used throughout this study showed so many more bacteria than by any previous technique that, until the work had been repeated, it was thought that the preparations must have been contaminated with bacteria from some outside source."

It is suggested that with some soils N/10 hydrochloric acid as an acid pretreatment and one of the erythrosins or floxines as stain may give better results, and the possibility of using 0.1 per cent or even more concentrated solutions of agar in place of the gelatin fixative here recommended is mentioned.

Actinomyces acidophilus n. sp.—a group of acidophilus actinomycetes isolated from the soil, H. L. JENSEN (*Soil Sci.*, 25 (1928), No. 3, pp. 225-236, figs. 6).—Report is made of the isolation, in the course of a study of the microflora of normal and of partially sterilized soils carried out at the State Plant Culture Laboratory, Lyngby, Denmark, of an actinomycete which developed on a dextrose-asparagin-agar medium having a pH of 3.8 to 4.0. The new organism first appeared in plate cultures from a dried peat having an acidity of pH 3.85, 100 to 200 colonies per plate appearing in a 1:2,000 dilution. Liming the soil resulted in the total disappearance of the organism within 15 days. The same organism was later isolated from two other soils similar in acidity to the first. The morphological and cultural characteristics, reaction requirements, and biochemical activities of the new species are detailed, and its systematic position is discussed. It is considered that in the sense in which the term was defined by Waksman (*E. S. R.*, 42, p. 434), the organism under discussion is properly to be described as a new "species-group," justifying the designation of it as *A. acidophilus*.

Studies on the effect of earthworms on the condition of the soil [trans. title], A. STÖCKLI (*Landw. Jahrb. Schweiz*, 42 (1928), No. 1, pp. 1-121, figs. 35).—This is a report in monographic form of an exhaustive study of the influence of earthworms on the physical, chemical, and bacteriological conditions in meadow, forest, and garden soils. The subject is considered under the following main subdivision headings: (1) Investigation technique, (2) the effect of the climate and of the soil on the activity of earthworms, and the effect of earthworms on (3) the physical properties of the soil, (4) the decomposition of the organic soil constituents, and (5) the bacteriological conditions of the soil.

The fixation of nitrogen by *Bacterium aerogenes* and related species, C. E. SKINNER (*Soil Sci.*, 25 (1928), No. 3, pp. 195-205).—Among the 28 strains of *B. aerogenes* isolated in the course of the investigation here reported from

the University of Minnesota from soil, from flour, and from water, at least 2 strains, possibly 3, were found capable, when grown in routine nitrogen-free media, of the fixation of atmospheric nitrogen. The strains of *B. radiobacter* isolated in these experiments were not all found to fix nitrogen. In the isolation of *Azotobacter*, *B. aerogenes* or *B. radiobacter*, and often both, were encountered, and *B. radiobacter* was nearly always found in the isolation of nodule bacteria. It is considered that a need for further work on *B. radiobacter* is indicated.

Nitrification in the soils of the Nikita orchard in the year 1925 [trans. title], I. N. ANTIPOV-KARATAEV (J. ANTIPOFF-KARATAIEFF) (*Zap. Gosud. Nikitsk. Opytn. Bot. Sada* (Jour. Govt. Bot. Gard., Nikita, Yalta, Crimea), 9 (1926), No. 2, pp. 54, figs. 2).—In a study of the nitrification process in various types of soil under the climatic conditions of the Crimea, the author correlated the various factors involved, with conclusions as follows:

The total amount of nitrogen in the layer of root penetration (about a meter) in the soils of Nikita Botanical Garden is sufficient for the most intensive process of nitrification. The curve representing the course of the nitrification process shows a low rate in the beginning of summer, a gradual rise in September, a sharp upward jump in early October, and a similar drop during the second half of October. The summer rains as well as artificial irrigation decrease the process of accumulation of nitrates, due to a lack of proper aeration during the period of water saturation. The heavy fall (and summer) rains not only create a depression of nitrification but also wash out some nitrates. A high temperature is conducive to an intensive nitrification. Cultivation is a very important factor in regulating the air-water system in the soil, influencing thereby the biological activities. The cultivated plats with a dry surface soil layer keep the lower layers uniformly moist throughout the season, while the noncultivated plats keep dry. Under the same conditions of cultivation the accumulation of nitrates is not alike in all soils. The structure of the soil is one of the important factors. The distribution of nitrates through the different layers is conditioned by the depth of cultivation and the mechanical composition. A localization of nitrates is found at the surface of uncultivated compacted soils.

Among the other phases of the mineralization of nitrogen the formation of nitrites was noted, especially on the plats which received barnyard manure and which were entirely covered with a crop. The intensity of the process of nitrification in orchard soils as found in samples taken between rows is similar to that of the fallow in the chernozem district. Tobacco and virgin soils give the same amounts of nitrates as chernozem soils under corn or sorghum after a fallow. In the shaly soils, low in lime, the process of nitrification was slow. During the period of intensive growth of tobacco no accumulation of nitrates was noted. An intensive nitrification is indicative of high activity of aerobic bacterial processes; this in turn is conducive to a mobilization of other mineral nutrients. A low moisture content did not hinder either the growth of higher plants or the process of nitrification.

The analyses of some green manures, A. W. R. JOACHIM (*Trop. Agr. [Ceylon]*, 67 (1926), No. 4, pp. 233-236).—Determinations of moisture in the natural state, moisture, organic matter, ash, and nitrogen in the sun-dried material, and the lime, potash, and phosphoric acid contents of the ash are reported for the following green manure crops: (1) Leguminous—*Vigna olgosperma*, *Indigofera endecaphylla*, *I. arrecta*, *I. hirsuta*, *Clitoria cajanifolia*, *Pueraria phaseoloides*, *Crotalaria striata*, *C. anagyroides*, *C. usaramensis*, *Tephrosia candida*, *T. hookeriana*, *T. vogelii*, *Desmodium triflorum*, *D. hetero-*

phyllum, *D. gyroides*, *Centrosema plumieri*, *C. pubescens*, *Calopogonium mucunoides*, and *Phaseolus calcaratus*; and (2) nonleguminous—*Oxalis* (leaves and bulbs), *Tithonia diversifolia*, *Canarium zeylanicum*, *Pavetta indica*, *Adathoda vasica*, *Thespesia populnea*, *Croton lacciferus*, *Memecylon capitellatum*, *Barleria*, and *Mikania scandens*.

Cover crops at Peradeniya in relation to soil moisture, A. W. R. JOACHIM and T. H. HOLLAND (*Trop. Agr. [Ceylon]*, 69 (1927), No. 5, pp. 261-264).—"These results would appear to indicate that when cover crops have been grown on soils, in the early stages of their growth up to a period of at least two years, the total moisture lost from these soils up to a depth of 18 in. is greater than from the same depth of bare soil during a period of drought. This is due to a greater amount of moisture being lost through transpiration from the leaves of the covers than is retained by the mulch of decomposing organic matter and humus formed by the latter. When the cover has been established for a longer period, the reverse appears to take place, that is, less moisture is lost from soils under cover crops than from bare soil. The amount of moisture retained by soils under covers in excess of what is lost through the leaves by transpiration is greater than that retained by the bare soil which loses a large proportion of its moisture through surface evaporation and capillarity."

Soil fertility and soil management experiments, C. G. SELVIG and A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpts.* 1926, pp. 22, 24, 25, 26; 1927, pp. 24, 26, 27).—Continued experiments (E. S. R., 56, p. 513) are reported for 1926 by Selvig and for 1927 by Dowell, dealing with progress results from a four-year rotation and continuous cropping experiments with small grains without fertilization, comparisons of phosphates and manures, the use of sweet clover for soil improvement, and trials with Soilvita, a commercial preparation advertised as containing bacteria beneficial to plant growth. This material was used with wheat, oats, and barley, with the result that no difference between the treated seed and the controls with respect to emergence, rapidity of growth, height, or color could be observed in any of these crops.

[Soil and fertilizer studies by the New York State Station] (*New York State Sta. Rpt.* 1927, pp. 22, 23, 25, 26).—Three lines of work are reported.

Lysimeter investigations.—The soils in the alfalfa rotation tanks have shown marked improvement of the succeeding barley and wheat crops as compared with the tanks in which timothy replaces the alfalfa in the rotation, this improvement having been noted continuously for the past 12 years in spite of continuous heavy nitrate losses in the drainage waters from the alfalfa tanks. Three rotations have been completed.

Investigations with straw manure.—Though the season of 1926 was not especially deficient in rainfall, it appeared that unless greater rainfall were to occur and forking over were frequent enough to allow good aeration, decomposition would not be sufficient in one year to permit the use of the product as an artificial manure.

Unproductive muck soils.—An attempt was made to determine the cause of the failure of lettuce to head on a strip of muck soil while successful crops were produced on adjacent muck soil. No significant differences in the nitrate content of the two soils could be demonstrated, but the 1926 season was wet and cold at the time when the lettuce was making its best growth, and the less productive muck produced normal head lettuce for the first time in this season. Laboratory studies have indicated that both of the soils under investigation might accumulate nitrates in toxic amounts, this accumulation appearing to diminish again under anaerobic conditions.

[**Soil information for North Carolina**] (*North Carolina Sta. Soil Inform. Circ. 1* [1927], pp. [4]; *Agron. Inform. Circs. 2* (1927), pp. 6; 4 (1928), pp. 4; 6, pp. 3; 9, pp. 9, fig. 1).—The following circulars pertaining to soils have been issued in mimeograph form: Nos. 1, Your Soils May Be Examined without Cost to You at the N. C. State College; 2, Fertilizers Recommended for Important Crops of North Carolina Based upon Field Experiments; 4, Soil Acidity and Lime for North Carolina Soils, by L. G. Willis; 6, Use of Commercial Fertilizers by North Carolina Farmers, by C. B. Williams; and 9, Identification of North Carolina Soil Types, By W. B. Cobb.

Results for the year 1925 of the investigations of the Division of Field Experiments at Lüberzi (Moscow Government) [trans. title], A. N. VOL'SKAIÄ (WOLSKAJA) (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, No. 41 (1927), pp. 85–119, figs. 9; *Ger. abs.*, p. 119).—In the Moscow Government soil types, calcium carbonate in the form of ground limestone much increased the yield of grains (oats and rye), as well as of clover and vetch. The calcium carbonate showed its best effect in the second year after incorporation, the effect lasting through the third year. The first-year effect, with some exceptions, was not great. A significant influence of the calcium carbonate began on the loam soil types with the application of 4.5 metric tons per hectare (about 2 tons per acre), and on the sandy soil types appeared first with the application of 2.25 metric tons per hectare. When calcium carbonate and manure were applied together the increase was significantly greater than when these fertilizers were applied singly. The phosphorite flour applied to rye gave on the loam soil types a large increase in yield; not less in fact than from the application of 18 tons per hectare of manure.

A significant difference in the influence of various rates of application of the phosphorite flour (from 90 to 540 kg. of phosphoric anhydride per hectare) could not be demonstrated. The time of application of the phosphorite flour, whether in the fall, in May, June, or in July, had no influence on its effect. On light sandy soil the effect of the phosphorite flour was not marked. The mathematical analysis of the data obtained, made according to a method attributed to Ssapjegin, showed the entire dependableness of the largest part of the observed increase.

The influence of various raw phosphates on upland peat soils [trans. title], B. TACKE (*Jahrb. Moork.*, 14 (1925–1926), No. 1, pp. 3–11).—The author notes a recent renewed importation of raw phosphate, discusses the possible advantages of its application as compared with those of the use of pulverized Thomas slag on moor soils, gives percentages of total phosphoric acid and of finely ground material in a number of ground raw phosphates, including Florida soft and pebble phosphates, and describes comparative phosphate experiments on an undeveloped highly acid peat soil containing, on the dry basis, nearly 98 per cent of combustible matter, 0.65 per cent of nitrogen, 0.04 per cent of potash, and 0.05 per cent of phosphoric acid. Both field and pot experiments were made, and data both on the total dry yield and on the phosphoric acid content of the grain and straw produced are presented.

The general conclusion is drawn that the raw phosphates, ground to a suitable fineness and applied to the peat soil under examination after a liming of normal amount but still insufficient to remove entirely the acidity of the soil, fall little if any short of the effectiveness of Thomas slag. The price per unit weight of phosphoric acid at the place of application, together with fineness of grinding, are considered the deciding factors with respect to the economic value of the use of raw phosphates in the manner here outlined.

Fertilizers for west Tennessee, C. A. MOORE (*Tennessee Sta. Circ. 20* (1928), pp. 4, fig. 1).—Attention is called to the use of commercial fertilizers

only on soils found responsive to phosphates as an illogical practice, though it is noted that the preponderance of phosphoric acid carriers among available commercial fertilizers has probably been largely responsible for the practice. Brief mention is made of field experiments which indicated a commonly occurring depletion of nitrogen and an occasional local need for potash in various western Tennessee soils which are abundantly supplied with available phosphates. Fertilizer formulas for both the eastern and western sections of west Tennessee, specific in each case for each of three groups of crops, are given, together with some notes on mixing and on the value of sodium nitrate.

Commercial fertilizers, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 278 (1927), pp. 24).—This contains the usual analyses of fertilizers and limes required by law. It is noted that but few fertilizers sold in Vermont in 1927 failed to meet their guarantees.

AGRICULTURAL BOTANY

The activities of a constructed colloidal cell, D. T. MACDOUGAL and V. MORAVEK (*Protoplasma*, 2 (1927), No. 2, pp. 161-188, figs. 10).—Contributions are listed upon which the work herein reported is more or less based. Some of these have been noted (*E. S. R.*, 54, p. 426; 56, p. 516). New results are described in some detail.

Further investigations of the chemical nature of the cell-membrane, F. M. WOOD (*Ann. Bot. [London]*, 40 (1926), No. 159, pp. 547-570, figs. 3).—In continuance of the study of the chemical nature of the cellulose membrane, the first results of which have already appeared (*E. S. R.*, 56, p. 123), it was found necessary to investigate the occurrence of protein in the cell wall. One of the objects of the research was to distinguish definitely between pectin and cellulose in the cell wall and another was the effect of other substances present upon the reagents used.

A method has been developed for the detection of protein in the cell wall, and in connection with this a special apparatus has been devised. The results are recorded for examination of leaves, petioles, aerial and underground stems, and roots of various plants. Details are given.

Changes in plastids in variegated plants, I. HEIN (*Bul. Torrey Bot. Club*, 53 (1926), No. 6, pp. 411-418, pl. 1).—The author gives details brought out in his study of the conditions of the plastids in cells at the margins of the chlorotic areas in a number of variegated plants. In certain cases conditions on the margins of discolored areas are described which are supposed to result from the action of a chlorophyll-destroying agent, spreading radially and disorganizing the plastids as it penetrates from cell to cell.

The grand period of oxygen uptake [trans. title], M. G. STÄLFELT (*Biol. Zentbl.*, 46 (1926), No. 1, pp. 1-11, figs. 7).—In studies on different parts of young plants of *Sinapis alba*, the author found a well-marked grand period of oxygen uptake per unit of fresh weight and per organ, with a maximum for the cotyledons at the fourth germination period. Details are given for the other parts.

Permeability to oxygen in wounded and in intact seedlings of *Sinapis alba* [trans. title], M. G. STÄLFELT (*Biol. Zentbl.*, 46 (1926), No. 1, pp. 11-23, figs. 7).—The oxygen uptake of germinating seeds from air of normal composition is significantly less than that of which such seeds are capable. If the partial pressure of the oxygen is increased by from 20 to 50 per cent, an important increase of oxygen uptake occurs. It appears that the seed coats "hinder" oxygen diffusion.

If the roots are cut close to the cotyledon, a lowering of oxygen uptake by the cotyledons occurs, due supposedly to a lowering of oxygen permeability in the leaf tissue. This lowering can be lessened by increasing the partial pressure of the surrounding oxygen or by removal of the seed coat.

Moisture movement in wood.—I. S. REED (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 37-54, figs. 5).—From experimentation, here detailed as carried out on the exchange of moisture between disks of 1/8- and 1/16-in. birch veneer supplied with moisture but below the fiber saturation point, it appears that the rate of moisture movement in wood below the fiber saturation point depends upon the moisture content as well as upon the moisture gradient. Except for this limitation, fair agreement was obtained with the law of diffusion. The rate of moisture exchange between the disks was approximately proportional to the square of their combined thickness, and was within 15 per cent of the figures required by the law of diffusion for these experiments. From the few experiments carried out at a higher temperature it appears probable that the change in the rate of moisture movement with temperature rise is proportional to the change in the vapor pressure of water.

Growth and differentiation in plants. II. S. REED (*Quart. Rev. Biol.*, 2 (1927), No. 1, pp. 79-101, fig. 1).—The main portions of this article deal with dynamic and static aspects of growth and with differentiation and development.

It is considered reasonable to suppose that the position, as well as the size, of plant organs is definitely correlated with certain properties, morphological or physiological, of the other parts of the plant. The examples discussed are deemed to justify the extension of such studies.

Rhythmic growth and stimulation movement in plants [trans. title], H. ANDRÉ (*Biol. Zentbl.*, 46 (1926), No. 2, pp. 97-111).—This is a brief synthetic review of earlier and later opinions regarding stimulation and rhythmic growth in plants.

Mendelian ratios and the gametophyte generation in angiosperms. R. A. BRINK (*Genetics*, 10 (1925), No. 4, pp. 359-394, figs. 2).—"The evidence gleaned from studies of pollen on artificial media and from pedigree-culture experiments indicates that factors causing differential pollen-tube growth are to be looked for, mainly, among those whose chief action relates to carbohydrate transformations."

Removal and restoration of endosperm in cereals, particularly in maize, under aseptic conditions [trans. title], O. GRÜNFELD (*Bot. Centbl., Beihefte*, 42 (1926), 1. Abt., No. 3, pp. 355-374, fig. 1; 43 (1926), 1. Abt., No. 2, pp. 167-203, figs. 2).—Work and results are presented in systematic detail. Endosperm behaves somewhat as does living substance.

The contractile roots of *Oxalis incarnata*. D. THODAY (*Ann. Bot. [London]*, 40 (1926), No. 159, pp. 571-583, pl. 1).—Noting the view that the shortening of contractile roots is brought about by growth in parenchymatous cells with anisotropic walls which are more extensible transversely than longitudinally, the author states that the mechanism of contraction appears to be of a different kind in the case of *O. incarnata*. In the specialized swollen roots of this plant contraction in length is correlated not with growth but with a shrinkage in volume, owing to the withdrawal of sap from transverse zones of cells in the storage parenchyma, preceded by the disappearance of protoplasm from these cells. Between the zones of collapsing cells, transverse plates of turgescient cells which have retained their protoplasm prevent radial contraction, except in so far as they later become oblique to the axis, owing to friction between the periderm and the soil. Experimental data illustrate the

dependence of contraction on a water deficit. The contracting force is, therefore, atmospheric pressure acting on the outside of the root unbalanced by an equal pressure in the vessels, or atmospheric pressure together with a cohesion tension transmitted in the xylem from the transpiring aerial shoot or a growing bulbil. These forces are brought into action through the disappearance of protoplasm from the cells in an orderly sequence.

The essential difference between the contractile root of *O. incarnata* and a root of similar form serving merely for storage is thought to lie in the specialized behavior of its parenchyma. No initial structural difference has been detected between those cells which first collapse and those which longest maintain their turgescence.

Studies on the mechanics of anaerobic respiration in plant organs [trans. title], J. STOKLASA and J. BABEŠ (*Sborn. Českoslov. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.)*, 1 (1926), No. 1, pp. 1-46, figs. 2; Fr., Ger. abs., pp. 42-44).—The results of studies during 25 years are said to show clearly that anaerobic respiration of seeds of *Pisum sativum*, *Vicia faba*, *Lupinus luteus*, *Phascolus vulgaris*, *Hordoum distichum*, sugar beet roots, and potato tubers is not identical with the alcoholic fermentation caused by yeast.

The process of anaerobic fermentation in plant organs is said to be due to various glycolytic enzymes. It is stated that carbon dioxide, ethyl alcohol, acetaldehyde, acetic acid, and formic acid are formed during the process. As principal products, carbon dioxide and ethyl alcohol are always found. Acetaldehyde is formed only in small quantities as a secondary product, and acetic acid is formed from acetaldehyde. All the processes in plant cells are referable to reduction or to oxidation.

Respiration of potato tubers after injury, B. F. LUTMAN (*Bul. Torrey Bot. Club*, 53 (1926), No. 7, pp. 429-455, figs. 5).—From a study of the respiration of injured potato tubers, suggested by the results from a previous study (E. S. R., 54, p. 818), the author found that cutting a potato causes a rapid rise in the respiration rate during the second and third days after the injury, with a subsequent gradual fall in the curve until the normal rate of uninjured tubers is attained. If the cutting is repeated in from 5 to 7 days the curve does not rise so high, and repeated cuttings lower the curves until finally no response of the tuber is obtained.

Shortening the intervals between cuttings to 3 or 4 days does not increase the effect, in fact the injury stimulus disappears even more quickly. Lengthening the intervals between injuries to 11 or 12 days gave the plant an opportunity to recover, and the curves obtained following the latter cuttings more nearly approached that attained after the first cutting. If the cut surface remains uninjured from 18 to 22 days, the tuber regains its ability to respond to this type of stimulus. A crack in a tuber causes a response almost as large as a cut of twice the area. Bruising does not induce any marked increase in respiration rate. Tubers infected with scab or rot organisms give a much higher respiration rate than do sound tubers. The capability of response to injury is not lost in very old tubers which have been stored for 15 months.

The respiration curve shows a maximum the second day while the temporary stoppage layer is being deposited in the outer layer of cells. This maximum may be followed by a drop and by a second maximum the third or fourth day while the cells of the new cork cambium are dividing. Deep cutting did not produce a respiration curve equal to the original one. The injury fatigue apparently extends through a considerable portion but not all of the tuber. A cavity inside the tuber has practically the same effect as an external wound. The injury to respiration can be largely removed by washing the cut surface in

running water for from 1 to 3 hours. The respiration activators, or the substances on which they act, seem to be mostly in the external cells and are water-soluble. Injured tubers respire intramolecularly in an atmosphere of hydrogen, but this respiration is slight and does not respond to the injury stimulus. Chemical analysis of slices cut from tubers at various times showed an increase in the reducing sugar content. The gradual lowering of the respiration rate after wounding coincides with the rise in sugars.

Forms and limits of xerophytism in wheat, A. DRAGHETTI (*Forme e Limiti dello Xerofittismo nel Frumento. Forlì: R. Stazione Agraria, 1927, pp. VIII+311, figs. [22]*).—The first part of this publication deals with the transpiratory system of wheat and with general morphology and biology and the second with observations and studies on the physiology of transpiration in wheat.

Biological studies in Ramularia.—I, *R. geranii* and *R. adoxae*. [II], *R. saxifragae*, *R. variabilis*, *R. lampsanae*, and *R. parietariae* [trans. title], C. KILLIAN (*Rev. Path. Vég. et Ent. Agr.*, 10 (1923), No. 4, pp. 277-302, pls. 8, figs. 2; *Min. Agr. [France], Ann. Épiphyties*, 12 (1926), No. 3, pp. 147-164, pls. 6).—These studies are both biological and phytopathological in character.

I, *R. geranii* and *R. adoxae* (pp. 277-302).—The author compares his own observations with those reported earlier by authors named as regards morphological characters of *Ramularia* in its hosts, but not as cultured on artificial media. It is claimed to have been shown that the biology of certain parasitic fungi is in close relation with particular characters of the respective hosts.

[II], *R. saxifragae*, *R. variabilis*, *R. lampsanae*, and *R. parietariae* (pp. 147-164).—It is stated in this section that the characters which are displayed by these organisms in culture are generally shown likewise in their natural media (hosts), though in those numerous instances in which the artificial media furnish abnormal conditions a simplification of structure is observable.

The endophytic fungus of Lolium.—II, The mycorrhiza on the roots of *Lolium temulentum* L., with a discussion on the physiological relationships of the organism concerned E. I. MCLENNAN (*Ann. Bot. [London]*, 40 (1926), No. 157, pp. 43-68, pls. 3).—In continuation of a previous account,¹ it is stated that the presence of an endophytic mycorrhiza in the roots of *L. temulentum*, *L. perenne*, *L. multiflorum*, and *L. subulatum* has been established, and a cytological examination of infected roots has been made in the case of darnel. The occurrence of a mycorrhiza in this grass supports the suggestion that the evolution in *Lolium* has been along a line similar to that of the *Calluna* type. Details are given.

"The demonstration of many infecting strands, together with the appearance of fat, firstly in the conducting and traveling hyphae of the root, with its subsequent removal to the sporangiole, and then to the host cell, accompanied by collapse and shriveling of the fungal mechanism, have led to the conclusion that metabolic exchange takes place from the fungus to the higher plant, with the result that the latter obtains a supply of fat or oil."

Knudson's results (E. S. R., 48, p. 223) with the nonsymbiotic germination of orchid seeds are examined, and fresh support is gained for the above conclusion. The idea that the exchange is carbonaceous rather than nitrogenous in character is also compatible with the suggestion which has been made of the relation between tuberization in plants and the presence of endophytic mycorrhiza.

The production of intumescences upon apple twigs by ethylene gas, R. H. WALLACE (*Bul. Torrey Bot. Club*, 53 (1926), No. 6, pp. 385-401, pls. 2).—Studies

¹ Roy. Soc. Victoria, Proc., n. ser., 32 (1920), No. 2, pp. 252-301, pls. 9, figs. 8.

confined thus far (during two years) to woody stems, observed chiefly from September to March, showed many cases of response to ethylene stimulation, evidenced by the formation of intumescences. Different species varied greatly in their response, the most pronounced type of intumescence, involving the destruction of buds and swelling of the apices and internodes, being obtained in *Pyrus malus*, *P. ioensis*, and *Ginkgo biloba*. Concentrations greater than 1 part of ethylene to 4,000 parts of air showed little or no increased intensity of reaction, and identical responses occurred in concentrations ranging from 1 to 7 to 1 to 4,000. The presentation time was 48 hours for most experiments, and a presentation time of 2 hours gave a response. Ethylene had no apparent effect on the chlorophyll in the chlorenchyma of woody stems. At least 80 per cent of the twigs which normally formed callus in the controls showed inhibition of callus formation after exposure to a low concentration of ethylene gas.

Recent observations on lupine nodules [trans. title], P. F. MILOVIDOV (*Centbl. Bakt. [etc.]*, 2. Abt., 68 (1926), No. 15-25, pp. 333-345, pls. 2, figs. 5).—Infection of lupine rootlets occurs in the same way as in the case of the other legumes, through infection strands which form in the root hairs and extend as intercellular zoogloea. The nodules form in the pericambium. The formation of the so-called bacteroidal tissue occurs through the division of cells which have already been infected, so that the bacteria are more or less equally distributed among the daughter cells. The mitotic fission figures of the infected cells of the bacteroidal tissue are normal in all respects. The numbers of bacteria in the older are larger than in the younger cells, independently of the volume increase in the former and of the increasing partition of the bacterial content with each cell division. Apparently the bacteria retain their capacity for partition for a very long time. Concluding the detailed findings, the author states that the presence of a large number of bacteria in the cell does not in itself indicate injury to such cell.

The relation of nitrogen transformations, particularly of nitrification, to degree of acidity in typical soils [trans. title], W. WÖHLBER (*Kühn Arch.*, 12 (1926), pp. 1-37, figs. 2).—Soil acidity is deemed unfavorable to nitrogen bacteria and may stop their activity entirely. Slight variation in H-ion concentration appears to be favorable. Alkalinity increases bacterial activity, particularly as regards nitrification. High acidity affects ammonification but little. Nitrogen loss (difference between nitrogen added and that found by analysis) was greater in alkaline than in acid soils.

Relation of soil moisture content to resistance of wheat seedlings to low temperatures, K. H. KLAGES (*Jour. Amer. Soc. Agron.*, 18 (1926), No. 3, pp. 184-193).—Under extreme low temperatures, low soil moisture, due to its retardation of the life processes of plants, is protective during the early stages of exposure, but after killing sets in it progresses rapidly. On soils having higher moisture, killing due to cold sets in earlier but progresses less rapidly. The more active the plants at the time of freezing, the more marked is the protective influence of low soil moisture during early exposure. More plants survive on high than on low moisture soils. Plants on soils containing from 40 to 50 per cent of moisture were the last to reach the point of complete killing.

The plant species in relation to habitat and climate, G. TURESSON (*Hereditas*, 6 (1925), No. 2, pp. 147-236, figs. 50).—Study of cultivated material has disclosed the differentiation of ecotypes in *Artemisia campestris*, *Rumex acetosella*, *Silene maritima*, *Allium schoenoprasum*, *Lythrum salicaria*, *Plantago major*, *Spiraea ulmaria*, *Succisa pratensis*, *Myosotis silvatica*, *Geum rivale*, *Leontodon autumnalis*, *Ranunculus acer*, *Melandrium rubrum*, *Rumex acetosa*,

Campanula rotundifolia, and *Solidago virgaurea*. Specialization of some of these in connection with habitats is indicated, and several ecotypic names are proposed.

It is pointed out that the factor depauperization, which results as a consequence of the horizontal spread of a species population through different climatic zones, becomes of still greater moment when projected vertically through geologic times. Because of the loss of genotype factors during intervening periods, the reappearance of a certain geologic period can not cause the reappearance of identical organic forms. Therefore, evolution is of necessity successive and directive.

GENETICS

Cytological investigations on the classification and phylogenetics of *Festuca* [trans. title], G. A. LEVITSKIĬ (LEVITSKY) and N. E. KUZ'MINA (KUZMINA) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 3-36, figs. 29; *Eng. abs.*, pp. 33-36).—The studies reported showed the diploid chromosome numbers in varieties pertaining to *F. elatior* to be 14, 42, and 70, and in those of *F. ovina* 14, 28, 42, and 70. The bearing of the studies on the relationship of the several varieties and on the geographical distribution of the genus is discussed briefly.

The cytology of *Secale* [trans. title], E. K. ĖMME (H. EMME) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 73-100, figs. 62; *Ger. abs.*, pp. 98-100).—The characteristics of the chromosomes of several species of rye, studied in different phases, are described and illustrated.

Cytological studies in *Vicia* [trans. title], I. N. SVESHNIKOVA (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 37-72, figs. 58; *Eng. abs.*, pp. 63-72).—Investigations continuing the work begun by A. G. Nikolaeva showed the diploid number of chromosomes in *V. faba* to be 12, in the group *ervum* 14, the group *cracca* 12, 14, 24, and 28, the subgroup *vicilia* 12 and 14, and the group *euvicia* 12 and 14. The characteristics of the chromosomes of the several species are described and illustrated and are the basis for arrangement of the species into a determinative key.

Variation in homoeotypic division in *Ranunculus acris*, H. SOROKIN (*Amer. Jour. Bot.*, 14 (1927), No. 10, pp. 565-581, pls. 2).—The present paper gives results of a study of homotypic division in *R. acris* (E. S. R., 58, p. 218).

The chromosomes of domestic animals [trans. title], H. F. KRAJLINGER (*Züchtungskunde*, 2 (1927), No. 9, pp. 441-466).—The author gives a review of the chromosome counts of the horse, ass, cattle, swine, dog, cat, rabbit, guinea pig, fowl, and pigeon, as reported by different investigators.

Constrictions in the chromosomes of *Drosophila melanogaster*, C. B. BRIDGES (*Biol. Zentbl.*, 47 (1927), No. 10, pp. 600-603, fig. 1).—The author describes the constrictions and weak places in the chromosomes of *D. melanogaster* which have been observed in cytological studies, and points out the possible relation of such to duplications, translocations, fragmentations, and other aberrations.

The experimental production of functional pollen grains having aberrant chromosome numbers [trans. title], T. SAKAMURA and I. STOW (*Japan. Jour. Bot.*, 3 (1926), No. 2, pp. 111-137, pl. 1, figs. 22).—The authors induced, by employing high temperatures in *Gagea lutea*, the development of pollen grains having aberrant chromosome numbers. These readily germinated on artificial media, and it was found that fertilization with grains so produced might give rise to polyploid or to nonpolyploid plants. It is thought probable that the

alteration of chromosomal or (under some conditions) even of external characters may be brought about more readily than has hitherto been thought possible, provided proper regard is had for the relations between the physiological characters of the plant itself and external conditions.

In case heat acts too strongly on the pollen, excessive anomaly may result, leading to sterility as pointed out by Stow (*E. S. R.*, 58, p. 320).

Another chlorophyll mutation in maize, R. J. GARNER and M. M. HOOVER (*Jour. Heredity*, 18 (1927), No. 12, pp. 542, 543, fig. 1).—A chimera bilateral in nature arose in a selfed strain derived from Leaming corn at the West Virginia Experiment Station. One-half of the plant was green and the other half, including tassel glumes, was green with white stripes of varying width. Indications were that the variation is heritable and recessive.

On the variation of the number and morphological characters of the chromosomes in interspecific hybrids [trans. title], M. S. NAVASHIN (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 17 (1927), No. 3, pp. 121–150, figs. 9; *Eng. abs.*, pp. 147–150).—This study is largely concerned with the cytology of hybrids between species of *Crepis*.

Two apricot mutations, G. P. WELDON (*Jour. Heredity*, 19 (1928), No. 1, pp. 15, 16, figs. 2).—A brief account of the occurrence of two apricot mutations, both of which have yielded asexual progeny displaying the same off type leaf characters. Concerning the inheritance of fruit characters the progeny of neither mutant has yet reached maturity.

Fatuoid and fatuo-steriloid oats [trans. title], M. SIROBOT (*Ann. Sci. Agron. Franç. et Etrang.*, 45 (1928), No. 1, pp. 42–47).—The appearance of the above variants in several cultivated varieties of oats is described.

Variation in spinach seeds, M. AKEMINE (*Jour. Heredity*, 19 (1928), No. 1, pp. 17–21, figs. 2).—Investigations at the Hokkaido Imperial University, Japan, showed that the number of spines on the seeds of prickly seeded spinach varies according to a leptokurtic curve. The variation takes two spines as the modal value and shows dispersion ranging from 0 to 1 and 3 to 8 in the negative and positive directions, respectively.

[Inheritance in *Phaseolus mungo*] G. P. HECTOR (*Bengal Dept. Agr. Ann. Rpt. 1926–27*, p. 36).—Observation on natural hybrids showed hairiness of pod dominant over smoothness, black pod color over yellow, mottled black seed color over uniform green and brown, and glossiness of the seed coat dominant over dullness. Segregation took place in approximately 3:1 ratios.

Inheritance studies in *Pisum*.—V, The inheritance of scimitar pod, O. E. WHITE (*Genetics*, 10 (1925), No. 3, pp. 197–210, figs. 10).—In continuation of statements previously noted (*E. S. R.*, 40, p. 225), the F₁, F₂, and F₃ generation results of crosses between eight different varieties of peas, breeding true to broad straight or broad slightly curved pods, and the variety Graue Riesen Schnabel, having narrow scimitar curved pods, are described in detail as regards the inheritance of the scimitar character.

It is stated that in F₁ the broad-pod character is nearly dominant. In F₂ two segregate classes are distinguished as broad straight or broad slightly curved pod types and narrow scimitar pod types, in a ratio approximating 3:1. The F₃ generation data give the results which are usually expected where a monohybrid F₂ ratio is involved. The gene for scimitar is designated *s*, while its normal allelomorph broad pod, etc., is *S*.

A dwarfing character in sweet clover, A. T. ELDERS (*Sci. Agr.*, 8 (1928), No. 7, pp. 438–440, figs. 2).—A dwarf biennial sweet clover found at the Brandon, Manitoba, Experimental Farm was inherited as a simple recessive to the normal type and may have had its origin in the mutation of a single factor. This dwarf was found to cross naturally with normal tall white sweet clover.

Inheritance of earliness in certain varieties of spring wheat, F. E. STEPHENS (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 12, pp. 1060-1090).—The inheritance of earliness was studied at Cornell University in hybrids involving the Dicklow, Marquis, and Federation late varieties, and the Reward, Prelude, and Master early varieties of spring wheat, in the parental to F_1 generations, inclusive. The date of emergence of the tip of the first head of each plant from the top of the sheath served as the index of earliness.

The mean of the F_1 population, while intermediate, was nearer to the early parent, and the means of the F_2 s were intermediate or tended toward the early parent. The F_2 varied more than either parent, with a range approximating the combined range of both parents, and the F_2 families exhibited almost all degrees of earliness within the limits of the parent varieties. Earliness in the varieties studied seemed due to the presence of a number of independent multiple factors cumulative in effect.

A positive correlation, $r=0.394\pm0.019$, was found between number of days from planting to heading and plant height in Federation \times Master. The occurrence of dwarfs in the cross between these varieties is explained by assuming the interaction of two pairs of factors, D, a dominant factor for dwarfness, and I, an inhibitor, which, when present in the dominant form, prevents appearance of the dwarf character.

Natural and artificial hybrids of a Chinese wheat and rye, C. E. LEIGHTY and W. J. SANDO (*Jour. Heredity*, 19 (1928), No. 1, pp. 23-27, fig. 1).—Results obtained at the Arlington, Va., Experiment Farm with wheat varieties grown in alternate rows with rye indicated that natural crossing between the species is comparatively rare. However, about 18 per cent of the plants of a Chinese common wheat grown next to rye were natural F_1 wheat \times rye hybrids. When emasculated flowers of the Chinese wheat received rye pollen 90.5 per cent set seed, and with wheat pollen 89.4 per cent set seed. The inheritance of crossability reported by Backhouse (*E. S. R.*, 37, p. 432) seemed to occur also in the natural wheat-rye hybrids at Arlington.

[*The Crataegomespili*], G. HABERLANDT (*Biol. Zentbl.*, 47 (1927), No. 3, pp. 129-151, figs. 12).—The question dealt with is whether the graft hybrids which are said to have originated at Metz from a graft of *Mespilus germanica* on *Crataegus monogyna* are really fusion graft hybrids or periclinal chimeras.

Two cases of close linkage in the Japanese morning-glory, Y. IMAI (*Genetics*, 10 (1925), No. 5, pp. 456-469).—In the Japanese morning-glory (*Pharbitis nil*) about 1.09 per cent of crossing over occurred in the segregation of dihybrid crosses involving the contracta type of foliage and the white-margined flower. Nearly the same percentage (1.01 per cent) of crossing over was also found in the linked characters yellow leaf and brownish flower. The hypothesis of factor interrelation set forth by Miyazawa (*E. S. R.*, 47, p. 524), as applied to the inheritance of yellow leaf and brownish flower, is refuted.

Linkage studies in rice, L. F. CHAO (*Genetics*, 13 (1928), No. 2, pp. 133-169, figs. 3).—The genetic investigations with rice reported in this contribution from the Wisconsin Experiment Station were variously concerned with the inheritance and interrelations of and the factors responsible for characters including the awn, glutinous character, pericarp color, glume length, spikelet length, and the colors of the apiculus, stigma, leaf sheath, ligule, and hull. Three linkage groups were confirmed, and a fourth seemed to be indicated.

Internal secretions in evolution and reproduction, O. RIDDLE (*Sci. Mo.*, 26 (1928), No. 3, pp. 202-216, figs. 10).—The author discusses the part played by the endocrine secretions in reproduction and especially sex determination, reviewing briefly experimental work with pigeons at the Station for Experimental Evolution of the Carnegie Institution at Cold Spring Harbor, N. Y.

It was found that there was an excess of males among the birds hatching from the first eggs laid in the season, while an excess of females came from birds hatched late in the season. Wide crosses produced only male offspring. The yolks of the eggs produced early in the season were in general smaller than those produced late in the season.

The thyroid glands showed seasonal changes in size, being largest in the autumn and winter when the percentage of males was higher, and smallest in the summer when there was an excess of females. Energy determinations on yolks showed that the eggs of winter and early spring producing an excess of males contained less energy than eggs laid in the summer and early autumn. From this and the fact that there was an excess of fat in summer and fall eggs it is concluded that a high rate of metabolism is associated with the development of males and a low rate of metabolism with the development of females. Calorimeter tests were in agreement with this conclusion. Further, in bearing out the differences in the metabolic rate of embryos of the two sexes, it was found that larger percentages of males survived when eggs were incubated for a few days in an increased oxygen atmosphere, while larger percentages of the females survived when the eggs were incubated in a decreased oxygen atmosphere.

Studies of metabolism in adult animals have already indicated that the rate is reduced by confinement and age. Hybrids showed higher metabolism than either of the parents. Because of the higher rate for the offspring of wide crosses such are all males.

The metabolic changes occurring in various organs and in the composition of the blood, which are associated with ovulation, are described with particular reference to the periodic secretions of the various endocrine glands. As ovulation approaches the ovarian hormone is given off, the suprarenal glands enlarge, the sugar and calcium (parathyroid control) contents of the blood rise, and the oviduct shows a tremendous increase in size. The anterior pituitary body has been found to stir the ovary into action, which starts the increased functioning of the other organs. The secretions of the thymus are a necessary stimulation to the secretion of albumen and shell for the egg.

It is thus apparent that practically all of the internal secretions are related to reproduction. This is considered to be a phase of evolution peculiar to vertebrates. Success in breeding strains of pigeons with large or small thyroids appears to bear out this hypothesis.

Effects of age of parents on characteristics of the guinea pig, S. WRIGHT (*Amer. Nat.*, 60 (1926), No. 671, pp. 552-559).—From an analysis of the records of the guinea pig breeding experiments of the U. S. D. A. Bureau of Animal Industry, the author found that the amount of color in the coats of piebald guinea pigs and the occurrence of polydactyly were related to the age of the parents, the correlation ratio between the age of the dam and the percentage of white being 0.190 ± 0.015 . The biserial correlation ratio between the percentage of polydactyly and the age of the dam was 0.370 ± 0.018 .

Further than this all strains within the polydactyly-producing family, which varied in the percentage of polydactylous offspring produced, showed that greater proportions of the offspring were produced from parents of the younger age group.

The dependence of spotting on growth, sex, and age of parents [trans. title], E. LAUPRECHT (*Züchtungskunde*, 2 (1927), No. 12, pp. 609-616, figs. 3).—Measurements of the percentage of black on 6 black and white calves by means of a planimeter, using the photographs of the animals at different ages from 10 to over 200 days, showed that the proportion of black on the sides increased with age. The results of Dunn, Webb, and Schneider (*E. S. R.*, 50, p. 631),

showing that Holstein-Friesian males have a greater proportion of the surface in black, and of Wright (see above), showing that the percentage of the area of guinea pigs which is colored decreases with the age of the parents, are also cited.

Investigations of sex reversal in the domestic fowl [trans. title], O. KUHN (*Züchtungskunde*, 2 (1927), No. 11, pp. 568-585).—After briefly reviewing experimental work on this subject, the author concludes that the male and female sex hormones are specific, and that they may influence the development of secondary sexual characters in castrated birds of either sex.

Sex determination by the Manoiloff test and its use in animal breeding [trans. title], MAGNUS and I. SAIM (*Züchtungskunde*, 2 (1927), No. 11, pp. 557-567).—The authors report a considerable number of failures in the diagnosis of sex from blood samples of cattle and humans according to the Manoiloff test. They consider this method unreliable for the diagnosis of the sex of fetuses in utero.

The regulation of growth and the quantitative theory of sex determination [trans. title], J. SCHMALHAUSEN (*Biol. Zentbl.*, 47 (1927), No. 10, pp. 629-637, figs. 7).—The formation of material determining sex in the gipsy moth was found analogous to the process of growth, and could be expressed by the same formula. The sex-determining material must be considered as influencing the relation between the sex chromosomes and autosomes, with the understanding that $MM > F > Mm$, though the relative intensity of these factors and the sex chromosomes and autosomes in different races vary.

FIELD CROPS

✓ **A study of probable error methods in field experiments**, H. K. HAYES and F. R. IMMER (*Sci. Agr.*, 8 (1928), No. 6, pp. 345-352).—The reliability of different probable error methods was studied at the Minnesota Experiment Station in the light of mathematical expectation. In a part of this study the yields of small plots grown to the same variety of wheat were treated as if they represented data obtained from a study of different varieties grown in replicated plots. Conclusions drawn from separate probable errors calculated for each variety of four plots would have been erroneous in a number of instances, due to the wide deviation of the yields of these varieties from expectation, whereas conclusions drawn from generalized probable errors did not suffer from this defect. No advantage was found in the random arrangement of plots within each replicate over a uniform replication in the single case tested and when compared as in the problem. The deviation from the mean method (E. S. R., 50, p. 229) more closely approximated mathematical expectation than did Student's method in the two comparisons made, although Student's method gave a slightly lower probable error.

Yield data from rod rows of spring wheat at the station and substations and from varietal studies with corn at the station gave indications that Student's generalized probable error corrects for that type of variability which results in different average yields for the varieties in the different replication series. It would have an advantage over the deviation from the mean method when the mean yields of the different replication series are distinctly different and each replication series is grown on soil of fairly uniform yielding ability. The generalized probable error in bushels increased and in percentage decreased as the yield of the varieties increased. A generalized probable error calculated as a percentage of the general mean may be used to calculate the probable error in bushels for each variety, and is considered a more conservative

measure of the reliability of high-yielding varieties than the same generalized probable error in bushels used for all varieties.

[Field crops experiments at the Crookston, Minn., Substation, 1926 and 1927], C. G. SELVIG and A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpts. 1926, pp. 10-21, 28-37, 41, 42, 45-48, figs. 4; 1927, pp. 8-16, 17-23, 27-32, 36-45*).—Continued investigations (E. S. R., 56, p. 524) with field crops reported on for 1926 by Selvig and 1927 by Dowell and summarized from more or less extensive periods included varietal trials with spring and winter wheat, oats, barley, rye, corn for grain and silage, flax, alfalfa, soy beans, sugar beets, mangels, rutabagas, and annual hay crops; tests of wheat-flax and oats-flax mixtures; cutting trials with wheat; scarification investigations with sweet clover and alfalfa seed; germination trials with sow thistle seed; rotation, green manuring (sweet clover), plowing, fertilizer, seed treatment, seed selection, and spindle tuber control studies with potatoes; date of planting, spacing, fertilizer, plowing, and seed treatment tests with sugar beets; cutting tests with rusted wheat; and crop rotations.

[Crop studies in New York] (*New York State Sta. Rpt. 1927, pp. 24, 25, 31, 32*).—In further experiments (E. S. R., 56, p. 233) topping again increased the nicotine content of tobacco from 1 to 3 per cent. *Nicotiana rustica* plants were quite branching, and after curing the proportion of leaf to stalk was small, whereas in Big Orinoco the proportion was much higher, although the nicotine was considerably lower. The work showed that tobacco containing from 4 to 6 per cent of nicotine in the dry leaf can be readily grown, the method used resembling that for cabbage in the section.

Investigation of hardshell in beans showed that the conditions under which beans are harvested and stored largely determine the percentage of hardshell. Through regulation of the principal factors involved, temperature, relative humidity, and respiration, hardshell may be produced, prevented, or overcome at will. While beans enter into the hardshell condition readily, it is overcome slowly. Varieties differ considerably in their susceptibility to hardshell, and lots of beans of the same variety grown under different methods of culture may differ in hardshell. It appeared possible by crossing and selection to develop varieties of beans not liable to hardshell.

The Geneva Red Kidney bean, derived from a cross between white and red kidney beans, is more vigorous and productive, taller, and has plumper seed than the commonly grown Wells Kidney bean. It is free from hardshell and escapes bacterial blight.

Crops and their highest yielding varieties and strains for different sections of North Carolina, C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 8 (1928), pp. 3*).—Varieties of cereals, tobacco, cotton, sorgo, grasses, and legumes are indicated for the three regions of the State.

Outfield experimental results, H. C. PORTS (*Oklahoma Sta. Buls. 171 (1928), pp. 7; 172, pp. 8; 173, pp. 6*).—These publications report the results of cooperative experiments with field crops carried on in McIntosh, Creek, and Nowata Counties, respectively, during the period 1925-1927, and comprising variety trials with corn, wheat, oats, grain sorghum, sorgo, cotton, soy beans, mung beans, and cowpeas, and fertilizer tests with cotton.

[Crop experiments at the Werribee, Victoria, State Research Farm] (*Victoria Dept. Agr., Werribee Research Farm Guide Book, 1927, pp. 10-51, figs. 18*).—Investigations reported on in these pages in summary form for various periods included rotations, fertilizer and seeding tests with wheat and oats, green manure trials, breeding and seed treatment work with wheat, variety tests with wheat, barley, and oats, and pasture studies, all under dry land

conditions, and irrigation, cultural, harvest, variety, and fertilizer tests with alfalfa, all under irrigation.

Paper mulch trials at Arlington Experiment Farm, L. H. FLINT (*Amer. Jour. Bot.*, 14 (1927), No. 10, p. 628).—Field trials with paper mulch indicated that the definite and appreciable stimulation accompanying the mulch with certain crops might be due to increase in soil temperature, reduction in loss of soil moisture, and modified distribution of water. Under a block system practically covering the area, the germination, early growth, maturity, and yield of certain crops were consistently and substantially influenced. The block system further insured a satisfactory measure of weed control, eliminating all weeding and cultivation between rows. No information was gained on the economic utility of the practice.

A nitrogen factory on every farm, O. H. SEARS (*Illinois Sta. Circ.* 326 (1928), pp. 12, figs. 3).—A popular discussion is given of the benefits to be had from the inoculation of legumes resulting in soil improvement and more and better produce, of the inoculation groups of legumes, and of conditions for and methods of inoculation. Experiments on which the discussion is extensively based have been noted elsewhere (*E. S. R.*, 58, p. 327).

On the stability of the chemical composition of leguminous plants and of corn [trans. title], N. N. IVANOV (*Trudy Prikl. Bot. i Selekt. (Bul. Appl. Bot. and Plant-Breeding)*, 17 (1927), No. 2, pp. 225-259; *Eng. abs.*, pp. 253-259).—Peas, lentils, vetch, and horse beans grown under widely different conditions of soil, moisture, and climate maintained the protein contents of their seed with but slight variation. Contrary to other cereals (*E. S. R.*, 58, (p. 631), corn resembled the legumes in the constancy of its protein content. See also an earlier note (*E. S. R.*, 56, p. 34).

Intervarietal competition among small grains, G. H. STRINGFIELD (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 11, pp. 971-983, fig. 1).—Observations in the 3-row (rows 1 ft. apart) nursery plats of wheat and oats at the Ohio Experiment Station showed only occasional indications of yield disturbance from competition. Competition acted weakly, if at all, in causing a contrast between adjacent border rows surpassing that existing between center rows of contiguous 3-row plats, nor was there much evidence that greater variability was caused thereby in border than in center rows. Direction of rows did not measurably affect the tendency for competition to alter yields. The author holds that in attempts to detect effects of competition by establishing a correlation between relative yield and competing strength among adjacent 3-row plats the relative yield may have to be established by using all three rows. This is to overcome a tendency toward a negative correlation of the measures brought about by comparatively gross independent fluctuations of the center rows where only center rows are used to establish the relative yields. Under the conditions described competition may be minimized by grouping varieties generally similar in growth and time of maturity.

Competition between adjacent rows of corn, P. J. OLSON (*Jour. Amer. Soc. Agron.*, 20 (1928), No. 1, pp. 83, 84).—Howe Alberta flint corn, extremely early, and averaging about 4 ft. high and 20.1 bu. per acre, and Howe Alberta×Minnesota No. 13, averaging 6.5 ft. and 40 bu., were grown in alternate 3-row plats at the North Dakota Experiment Station. The average yields of the middle and border rows indicated that, in line with the observations of Stringfield (see above), Howe Alberta was not affected by competition with the adjacent hybrid rows.

The ecological basis of cereal culture [trans. title], H. L. WERNECK-WILINGRAIN (*Pflanzenbau [Berlin]*, 1 (1925), Nos. 23, pp. 393-405, figs. 2; 24, pp. 419-425, fig. 1; 2 (1925), No. 1, pp. 7-13, fig. 1).—The general plant geo-

graphical basis of grain culture is discussed, with attention to the combined effects of environmental factors. The author points out the physiological significance of the natural distribution regions of species, indicates the natural vegetation regions of wild plants in Germanic settlements of middle Europe, and describes the basis of varieties of cereal species. The practical application of agricultural ecology in experimental work and plant breeding is shown.

The density of the spikes of cereals [trans. title], J. VÈNE (*Jour. Agr. Prat.*, n. ser., 48 (1927), No. 50, pp. 473-476, figs. 4).—The instrument used to study the density of wheat spikes and illustrated with plans is described as being very convenient and as giving accurate results rapidly, although it is more complicated than apparatus generally employed.

Investigations on yield in the cereals.—IV, The action of the seed drill, F. L. ENGLENDOW (*Jour. Agr. Sci. [England]*, 18 (1928), No. 1, pp. 1-40, figs. 7).—The studies reported were concerned with the conjoint and separate influences of the drill and the tilth and general husbandry on the fluctuations of yield in cereals.

Census counts (E. S. R., 56, p. 227) of seeds and plants on unit length of row in four normal fields showed that it is difficult to separate the contributions to fluctuation arising from the inherent mechanical action of the drill and from disturbances in that action which soil variation and irregularity in tilth induce. Per foot and per inch distributions suggested that seed deposition on these and intermediate lengths of row is almost random. While drill action was disturbed by unevenness of tilth, no systematic association appeared to exist between tilth irregularity and fluctuations in seed or plant density along the row.

In a preliminary analysis of drill mechanism the outstanding feature proved to be inconstancy of cup load, i. e., number of seeds delivered by any and every cup of the drill into the hoppers. From this cause alone wide fluctuation in per foot deposit of seed seemed to be inevitable. Improvement in cup design appeared to be the important requirement for more constant drill action.

Varieties of wheat, barley, oats, and rye, F. TODARO (*Razze di Frumento, Orzo, Avena, e Segale. Bologna: Ist. Bologn. Cerealicolt.*, 1927, pp. 19, pls. 50).—Outstanding varieties, selections, and hybrids of cereals being carried forward at the Bologna Institute for Cereal Culture are described and illustrated.

Chicory growing in Michigan, C. E. CORMANY (*Michigan Sta. Spec. Bul.* 167 (1927), pp. 11, figs. 5).—Between 8,000 and 10,000 acres, or about 95 per cent of the chicory crop in the United States, are grown each year in Michigan, principally in counties near Saginaw Bay. The soil, cultural, and harvesting requirements of the crop are outlined, with notes on feeding the tops and manufacturing the product.

Standard varieties of corn for the mountain, Piedmont, and Coastal Plain sections of North Carolina, G. M. GARREN (*North Carolina Sta. Agron. Inform. Circ.* 5 (1928), pp. 2).—Comparative tests at the station and substations during the periods 1914-1918 and 1926-27 showed Biggs Prolific, Southern Beauty, F. Cross No. 182, and Latham Double to be outstanding among corn varieties.

Cotton variety experiments, T. S. BUIE, W. B. ROGERS, and E. E. HALL (*South Carolina Sta. Bul.* 244 (1928), pp. 23).—The King, Cook 1010, and Coker Cleveland 5 varieties produced the highest yield of seed cotton during the period 1924-1927 at the station. Carolina Foster led the long staple varieties in yield. Dixie Triumph, closely followed by Cleveland 5, Humco Cleveland 20, and Woolsey Cleveland led at the Pee Dee Substation in the period 1925-1927. Carolina Foster, Lightning Express, and Deltatype Webber of the long staple

varieties made similar average yields, and Dixie Triumph, Dixie 14, and Super Seven were outstanding during a 2-year test on land badly infected with wilt. Coker Cleveland and Woolsey Cleveland averaged the highest over the period 1924-1927 at the Coast Substation. The results in all the tests indicated that the best strains of Cleveland led in the production of seed cotton on wilt free land.

A chemical study of varieties of cotton seed, M. T. HARRINGTON (*Texas Sta. Bul. 374* (1928), pp. 19).—Seventy-three varieties and strains of cotton were grown, harvested, and ginned under uniform conditions at the station, and the seed therefrom were compared by means of chemical analyses.

No relation was apparent between the weight and size of seed and the percentage of oil in the seed, and no appreciable variation was found in the index of refraction, iodine number, and saponification number of the oil from the seed of the different varieties. Cotton varieties with lint within the range of from $\frac{7}{8}$ to $1\frac{1}{8}$ in. long had slightly higher oil contents in their seed than varieties with longer or shorter staple, and on the average, seed with the highest percentage of meats contained the highest percentage of oil. Acala, Burnett, Half-and-Half, and Mebane had the maximum oil contents. The protein content of the oil-free and water-free meats was generally highest in the seed having the highest oil content.

Facts about improved cotton seed for North Carolina based upon field experiments (*North Carolina Sta. Agron. Inform. Circ. 3* (1927), pp. 4).—Varietal tests with cotton over 12 years have resulted in the replacement of low-yielding cottons of poor quality by strains of the standard varieties, Cleveland and Mexican, which now cover from 70 to 75 per cent of the cotton acreage of the State.

Results of cotton spacing experiments, with recommendations, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ. 10* (1928), pp. 3).—Spacing experiments with cotton suggested leaving about two plants per hill in hills from 9 to 11 in. apart in rows from 3.5 to 4 ft. apart in the Coastal Plain and from 8 or 9 in. apart in rows from 3 to 3.5 ft. apart in the Piedmont.

The spacing of cotton, C. A. MOOERS (*Tennessee Sta. Circ. 19* (1928), pp. 2).—Spacing studies with cotton at the West Tennessee Substation, considered with results at other stations, led to the recommendation for 3.5-ft. rows of 1 plant in hills 14 in. apart with allowable limits of from 11 to 16 in.; 2 plants per hill 20 in. apart and from 17- to 22-in. limits; 3 plants per hill 23 in. apart and from 21- to 26-in. limits; and 4 plants per hill 25 in. apart with allowable limits of from 22 to 28 in. Equivalent spacings are given for 3- and 4-ft. rows. Cotton should be thinned only when the plants are small and have only from 4 to 6 leaves.

Cotton bagging for cotton, B. YOUNGBLOOD, R. J. CHEATHAM, and R. L. NIXON (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. [2]+13, pl. 1*).—Four weights of cotton bagging designed in this Department and woven in the co-operative testing laboratories at Clemson College and the North Carolina State College were compared with jute in test shipments of cotton to Germany and return to the United States. It was reported from Hamburg that "the bales covered with cotton bagging were much neater and in better condition generally than those covered with jute bagging."

Breaking-strength tests of the cotton bagging, together with the shipping test, indicated that from the viewpoint of durability, protection to the cotton, and neatness, cotton bagging is a more suitable covering for the American cotton bale than is jute. After the return of the bales more than 400 lbs. of the cotton bagging was stripped from the bales and garnetted into waste valued at

from 10 to 12 cents per pound. Fiber salvaged from used cotton bagging may be reused, alone or mixed with other low-grade cottons, in the manufacture of cotton bagging, osnaburg, or other coarse fabrics or articles. The loss in ginning was estimated to be less than 2 per cent.

Hemp and hard fibers, O. HEUSER ET AL. (*Hanf und Hartfasern*. Berlin: Julius Springer, 1927, pp. VII+266. figs. 105).—The botanical, agricultural, commercial, and technological characteristics of hemp and other cordage fibers are discussed in chapters the translated titles of which are as follows: The Hemp Plant, by O. Heuser (pp. 1-102) (E. S. R., 53, p. 235); The World Hemp Industry, by P. Koenig (pp. 103-118); Mechanical Technology of Hemp, by O. Wagner (pp. 119-154); Chemical Technology of Hemp, by G. von Frank (pp. 155, 156); World Industry and Agriculture of the Hard Fibers and Other Fibers, by P. Koenig (pp. 157-196); and Manufacture of Exotic Fibers into Cordage, by H. and F. Oertel (pp. 197-263).

Single-plant selection in paddy on the Samalkota Experimental Station, G. JOGIRAJU (*Madras Agr. Dept. Yearbook 1926*, pp. 95-123, pls. 2).—Technique is outlined, with the characteristics of a number of varieties and selections of rice.

The effect of salt water on rice, G. S. FRAPS (*Texas Sta. Bul. 371* (1927), pp. 10).—Further tests and observations (E. S. R., 21, p. 540) on the damage caused to rice by salt in the irrigation led to the suggestion that pumping be stopped when the water contains from 40 to 50 grains of salt per gallon, unless the crop is likely to suffer more from deficiency of water than from the salt in the water. Water containing much more salt, however, has been used with fair yields, especially after August 1. A method for the approximate estimation of salt in water is outlined.

Summary of variety tests of soybeans and recommendations for North Carolina, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ. 7* (1928), pp. 4).—Soy bean varieties are recommended for seed, hay, grazing hogs, planting in corn, and for soil improvement in the Coastal Plain, Piedmont, and mountain sections of the State as the result of varietal tests reported.

Sudan grass [trans. title], S. VOROBLOV (VOROBIEV) (*Trudi Silsk. Gosp. Bot. (Jour. Agr. Bot. [Ukraine])*, 1 (1926), No. 1, pp. 75-79; *Eng. abs.*, pp. 78, 79).—Experiments at the Kharkof Zootechnical School showed Sudan grass to have a considerably longer vegetative period and a much lower coefficient of transpiration than millet and small grain. The crop has produced good yields under both moist and drought conditions in the Ukraine. Sudan grass responded to increases in moisture content over the range of from 40 to 100 per cent, with increases in the coefficient of tillering, whereas millet remained stationary. The grass made its greatest yield in pots at 80 per cent moisture content. The seed:straw ratio was 1:36 at 100 per cent and 1:25 at 80 per cent.

Sugar beet development, E. ZALESKI (*Sugar [New York]*, 30 (1928), No. 2, pp. 75-78, figs. 2).—The tabulated sugar contents and yields of sugar beets grown from seed of leading German and Polish varieties during extensive periods (1892-1913, 1904-1926) showed gradual improvement in the sugar contents and yields. The rate of increase appeared to become faster as the genetic composition of the strains became simplified, although the time appears to be near when the strains having become homozygotic in regard to sugar content can no longer be improved without recourse to hybridization.

Seed production from sugar beets overwintered in the field, J. C. OVERPECK (*U. S. Dept. Agr. Circ. 20* (1928), pp. 8, figs. 3).—Experiences in growing sugar beet seed in cooperation with the New Mexico College of Agriculture and Mechanic Arts have been essentially noted from a previous publication (E. S. R.,

57, p. 529). The method of seed production is simply a method of steckling production without the expense of harvesting, storing, and resetting the stecklings (small late-planted sugar beets harvested in the fall and stored over winter in soils to be transplanted to the field the following spring for seed stalk production). Experience so far indicates that the loss of plants in the field is far below the loss which occurs often in siloed stecklings or mother beets. The heaviest seed yields have been obtained where the plants grew thickest.

[**Sugar cane experiments in Hawaii**] (*Assoc. Hawaii. Sugar Technol. Rpts.*, 6 (1927), pp. 40-110, figs. 14).—Papers of agronomic interest embraced in these pages include The Duty of Water, by N. King (pp. 40-52); Preliminary Studies of the Amounts of Plant Nutrients Taken Up by Hawaiian Cane Crops, by G. R. Stewart, C. L. Crutchfield, and F. R. Van Brocklin (pp. 52-56); The Method of Determining Extent of the Roots in the Soil, by H. A. Lee (pp. 56-69) (E. S. R., 57, p. 432); The Progress of Sugar Cane Roots in the Soil at Different Ages, by H. A. Lee and D. M. Weller (pp. 69-72) (E. S. R., 58, p. 433); An Interesting Habit of Sugar Cane Roots, by D. M. Weller (pp. 73-79); Why Root Studies? by W. P. Alexander (pp. 79, 80); Methods of Seedling Selection as Practiced by Various Cane Breeding Stations, by A. J. Mangelsdorf (pp. 80-100); Long Crops and Short Crops, by F. A. Paris (pp. 100-105); and The "Caterpillar" [Tractor] and the Sugar Plantation, by W. J. Maze (pp. 106-110).

Studies of imported varieties of sugar cane [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán*, 17 (1927), No. 11-12, pp. 235-258).—Information on the agronomic characteristics, disease resistance, and analyses of sugar cane varieties obtained from different parts of the world and tested in Tucumán (E. S. R., 52, p. 439) is brought forward to include results obtained in 1926.

Relation between high sucrose in cane and suckering, H. J. RODRIGUES (*Planter and Sugar Manfr.*, 80 (1928), No. 6, pp. 101, 102; also in *Facts About Sugar*, 23 (1928), No. 8, pp. 185, 186).—Experiments at the Louisiana Sugar Experiment Station involving the P. O. J. Nos. 36, 213, 228, 234, 826, 979, and 2379, Louisiana Purple, and Louisiana Striped varieties of sugar cane, gave results in accord with earlier trials (E. S. R., 5, p. 979) showing a direct relation between a heavy early stand, a low ratio of increase, and the highest sugar per ton of cane. The new sorts responded to the same treatment as the Louisiana Purple. Fall and spring field practices are suggested for the encouragement of early stands.

Tobacco culture (*Ontario Dept. Agr. Bul.* 333 (1927), pp. 35, figs. 26).—This publication, designed for beginners in southern Ontario, gives information on tobacco varieties; soil, climatic, and cultural needs of the crop; field, harvesting, and curing practices; and insects and diseases.

The viability of tobacco seed buried in the soil [trans. title], S. C. J. JOCHEMS (*Meded. Deli Proefsta. Medan*, 2. ser., No. 50 (1927), pp. 28, figs. 2; *Eng. abs.*, pp. 26, 27).—Buried seed of Deli tobacco, which apparently retained its viability for at least 8 years, seemed to be responsible for much of the contamination of seed (plant) beds on the east coast of Sumatra. An average of 10 per cent of the seedlings on certain beds came from buried seed. Destruction of stalks after harvest or making seed beds on virgin forest land is advised. In breeding work seed can be sown on sterilized soil in seed flats and seedlings transplanted to ordinary seed beds when from 15 to 20 days old. Sprouting the buried seed before the desired seed are planted was also effective in some measure.

Tobacco varieties and plant growing, R. E. CURBIN (*Clemson Agr. Col. S. C., Ext. Circ.* 91 (1927), pp. 8).—Practical information is given on the choice

of tobacco varieties for South Carolina conditions and on the preparation and management of the plant bed.

Tobacco soils and fertilizers, R. E. CURRIN and T. S. BUIE (*Clemson Agr. Col. S. C., Ext. Circ. 90* (1927), pp. 8).—The soil and fertilizer requirements for bright or yellow tobacco in South Carolina are described briefly.

Inheritance of awnedness, yield, and quality in crosses between Bobs, Hard Federation, and Propo wheats at Davis, California, J. A. CLARK, V. H. FLORELL, and J. R. HOOKER (*U. S. Dept. Agr., Tech. Bul. 39* (1928), pp. 40, figs. 6).—Studies in cooperation with the California Experiment Station were concerned with the inheritance of awnedness, the relation of awn length to yield, and the relation of awn length and kernel texture to the protein content of the grain from hybrid plants and strains under California conditions. The material studied included the F_1 , F_2 , and F_3 of the crosses Bobs \times Propo, Hard Federation \times Propo, and Bobs \times Hard Federation. All three are early spring wheats, but Bobs has awnless fusiform spikes, glabrous white glumes, short hard white kernels, short midstrong stems, and is very susceptible to shattering; Hard Federation has awnless oblong spikes, glabrous brown glumes, short hard white kernels, and short strong stems, and is fairly resistant to shattering; and Propo has awned fusiform spikes, glabrous white glumes, midlong soft white kernels, and midstrong stems, and is very resistant to shattering.

Imperfect dominance of awnlessness was shown. The Bobs \times Propo crosses appeared to differ by two major genetic factors (*AA* and *BB*) and the Bobs \times Hard Federation crosses by two minor factors (*CC* and *DD*). While the Hard Federation \times Propo crosses were the most complicated, it was possible to interpret the results as due to two major and one minor factors. Apparently the only effect of the other minor factor in the presence of one of the major factors is to reduce uniformly the amount of awnedness. It is concluded that there may be as many as four genetic factors involved in awnedness inheritance in some wheat crosses.

The extent of shattering in the hybrids increased with the length of the awns even though the awned Propo parent was most resistant. Most of the hybrids were intermediate between the parents as to shattering, but there appeared to be resistant plants in all awnedness classes. Only a slight tendency was observed for yield to increase with increasing length of awns in hybrid plants and strains.

Texture of kernel seemed to be strongly inherited, although the number of genetic factors involved could not be determined from the data. In crude protein content the parents ranked in 1925 in the order of Bobs, Hard Federation, and Propo, which was the reverse order of their yields. Bobs \times Hard Federation led the crosses in F_1 for crude protein content as well as yield. Very few hybrid F_2 plants or F_3 strains exceeded the best parent plants or rows in crude protein content. While no significant difference was found between Hard Federation and Bobs, the latter was most potent in transmitting high protein to its hybrid plants and strains. With the crosses studied and under the conditions, crude protein content did not decrease with the increase in length of awn. A slight although not consistent tendency existed toward increased protein content with increase of hardness in texture of kernel from hybrid plants and strains.

Comments are also made on the product of yield \times protein and on the correlated inheritance of yield and protein and the relation between these characters.

The length and color of the coleoptile in different wheat species [trans. title], M. PRIKHOD'KO (PRIKHODJKO) (PRIKHODKO) (*Trudi Sibirsk. Gosp. Bot.*

(*Jour. Agr. Bot. [Ukraine]*), 1 (1926), No. 1, pp. 43-45; *Ger abs.*, p. 45).—Studies with several botanical varieties of wheat showed the coleoptile in *Triticum durum* to be usually longer than in *T. vulgare*. Sprouts of either species may or may not show anthocyanic coloration. Representatives of *T. vulgare* could be grouped for coloration on the coleoptile and first leaf, and the *durums* generally for coloration on the first leaf only. The color was more intense in *T. vulgare* than in *T. durum*.

Symposium on seed improvement (*Jour. Amer. Soc. Agron.*, 20 (1928), No. 1, pp. 1-35).—This symposium, held at the meeting of the American Society of Agronomy in Chicago in November, 1927 (E. S. R., 58, p. 200), included the following papers: The Improvement, Distribution, and Maintenance of Farm Crops as Discussed from the Experiment Station Viewpoint, by T. A. Kiesselbach (pp. 1-14); Multiplication of Improved Seed Through Seed Associations, by H. C. Rather (pp. 15-22); and Some Problems of Seed Improvement and Distribution, by F. W. Kellogg (pp. 23-35).

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul.* 277 (1927), pp. 12).—The outstanding results in the analysis for purity, germination, and weed seed content are indicated for 433 samples of agricultural seed collected from dealers in Vermont during April and May, 1926.

HORTICULTURE

[**Horticultural investigations at the Crookston, Minn., Substation**], C. G. SELVIG and A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpts.* 1926, pp. 42-45, 48-52, figs. 2; 1927, pp. 45-49).—Continued investigations (E. S. R., 56, p. 531) reported on for 1926 by Selvig and 1927 by Dowell briefly discuss the results of various cultural, fertilizer, and varietal tests with fruits, vegetables, and ornamentals.

[**Horticultural investigations at the New York State Station**] (*New York State Sta. Rpt.* 1927, pp. 25, 26, 27, 36, 51-53).—The usual annual report (E. S. R., 56, p. 235.)

Greenhouse nutrient studies with own-rooted Hubbardston apple trees indicated that a pH value around 5.5 is most favorable for growth. Studies upon the maintenance of fertility in nursery soils showed that on extended use these may become exceedingly unproductive. As measured in growth of cover crops, fertilizers had a marked effect on restoring fertility. It is concluded that fertilizer may have its greatest benefit in stimulating cover crop growth, which in turn supplies the essential organic matter.

Experiments in fertilizing mushroom beds are again reviewed (E. S. R., 58, p. 138). Investigations in the Hudson River Valley showed the danger of using oil sprays for apple when the temperature was near 32° F. Spray residues were satisfactorily removed at an estimated cost of about 1 ct. per bushel by immersing fruit in a solution of 1 part hydrochloric acid in 500 parts of water. The washed fruit did not deteriorate more rapidly than controls during 9 months of cold storage. Fruit breeding operations were continued, one apple and three raspberries being named during the year. Fertilizer experiments in the Hudson River Valley with apples, cherries, and grapes and at Fredonia with grapes showed nitrogen to be the chief limiting nutrient. Fifteen years of study revealed no differences in any character between budded and grafted apples of the same varieties. A top-working experiment in which several standard varieties of apple were worked on Northern Spy and French crab roots leads to the conclusion that the French crab is a slightly superior stock. Data obtained by bud selection study with the Rome apple showed somewhat higher yields for the progeny of productive

parents. The results of a comparative test of Mahaleb and Mazzard cherries as stocks for cultivated sweet and sour varieties are again discussed (E. S. R., 57, p. 535).

Report of the division of horticulture, W. T. MACOUN ET AL. (Canada Expt. Farms, Div. Hort. Rpt. 1926, pp. 76, figs. 15).—As for the preceding year (E. S. R., 57, p. 236), fruit breeding continued to be a major activity. Eight more of the recently named seedling apples are described, and a list is presented of all seedling apples which have been named, described, and disseminated by the department. One pear, a cross between Kurskaya and Flemish Beauty, showed excellent merit as a canning variety, possessing excellent texture, handsome golden color, and good flavor. Considerable variation in size, color, and quality was noted in the fruits of *Prunus tomentosa* seedlings, useful as jelly producing fruits. Various recently introduced fruits from the United States, Canada, and Europe are briefly described, and yield records for gooseberries and currants are presented.

Further studies on the effect of the time of applying nitrogen fertilizers upon the strawberry again showed the value of nitrogen, and led to the conclusion that even for strawberries growing in soils that may be termed in good tilth artificial nitrogenous fertilizers have a distinct value and may cause yield increases up to 65 per cent. Applications of nitrogenous fertilizers made during the first fruiting season materially influenced second year production. As compared with September 15 for the first year, August 15 seemed to be the latest advisable date to apply nitrogen in the second year. Spring applications were of doubtful value in the second year of the plantation. Chlorotic conditions of three distinct types were observed in strawberry plants.

The influence of ammonium sulfate as a direct source of nitrogen for apple trees is again discussed by Davis (E. S. R., 58, p. 38), leading to the same conclusion that this form of nitrogen is not directly available to the apple tree.

The results of extended variety tests with vegetables are reported. Experimental Farm selections for earliness and uniformity have given excellent results, particularly with tomatoes. Considerable work was done in the isolation of uniform seed stocks of various vegetables. Variety testing of peonies, carnations, gladioli, and sweet peas was actively pursued.

[Horticultural investigations at the Canadian experimental stations and farms] (Canada Expt. Farms, Rpts. Supts. 1926, Agassiz (B. C.) Farm, pp. 15-20, 22-24, 25-28; Cap Rouge (Que.) Sta., pp. 26-30, 31-37, 38, figs. 2; Charlottetown (P. E. I.) Sta., pp. 23-32, 34, 35; Fredericton (N. B.) Sta., pp. 19-29, 44, 45, 46; Harrow (Ont.) Sta., pp. 20-22; Indian Head (Sask.) Farm, pp. 33-39, 40-46; Invermere (B. C.) Sta., pp. 12-17, 20-24, 25; Lennoxville (Que.) Sta., pp. 31-42; Lethbridge (Alta.) Sta., pp. 33, 34, 35-38, 38-43; Morden (Man.) Sta., pp. 17-41, figs. 8; Rosthern (Sask.) Sta., pp. 25, 27-36; Ste. Anne de la Pocatière (Que.) Sta., pp. 26-38; Swift Current (Sask.) Sta., pp. 36-40, 42-45, fig. 1; Expt. Substas. Rpt. 1926, pp. 5-13, 15-21, 34, 35, 36).—Herein are presented brief reports by W. H. Hicks, G. A. Langelier, J. A. Clark, C. F. Bailey, H. A. Freeman, W. H. Gibson, R. G. Newton, J. A. McClary, W. H. Fairfield, W. R. Leslie, W. A. Munro, J. A. Ste. Marie, J. G. Taggart, and R. Jones, respectively, on the results of miscellaneous horticultural investigations, principally cultural, fertilizer, and variety tests of fruits, vegetables, and flowers.

[Horticultural investigations at the Summerland, B. C., Experimental Station, 1926], W. T. HUNTER (Canada Expt. Farms, Summerland (B. C.) Sta. Rpt. 1926, pp. 6-42, 43-49, figs. 3).—In studies of internal breakdown of apples it was found that this condition was more abundant in Rome and

Delicious apples grown on heavy clay and in Wagener apples on light, sandy soil than from other sites. Water core was observed to be a predisposing factor. Oversized fruits appeared particularly susceptible, and in all varieties the hazard increased if the fruit was left too long on the tree. Immediate storage of apples at 32° F. materially retarded the onset of breakdown. Grimes apples, however, did not keep satisfactorily at this temperature.

Fruit breeding commenced in 1924 showed Delicious, Yellow Newtown, and Rome to be producers of excellent pollen, McIntosh poor pollen, and Winesap almost a failure. In cultural investigations alfalfa was found an excellent orchard intercrop except in times of water shortage, when trees on shallow soils suffered. On such soils hairy vetch proved more satisfactory and is deemed the most desirable annual cover crop for the Okanagan Valley. Continued clean culture so weakened apple trees that they were badly winter injured. Various crops, mangels, corn, oats, potatoes, and other vegetables were found satisfactory as orchard intercrops provided fertilizers were added.

Nitrate of soda applied in March of the off year to Wagener apple trees failed to give immediate results but apparently increased yields the next off-bearing year. No evidence was obtained to indicate that potash or phosphoric acid exert any appreciable influence on the size or quality of apples grown in the British Columbia dry belt. Filler apple trees proved unprofitable as they crowded the permanent trees very quickly.

All of four methods of top grafting, cleft, bark, notch, and whip, proved successful with apples. Parawax proved to be a safe and efficacious substitute for grafting wax. Pears were successfully top worked, but stone fruits gave dubious results.

The maturity of apples and pears was established by change in size, in skin color on the unblushed side, and in ease of separation from the spur. Of several types of pruning employed at the station, the modified leader proved the most satisfactory.

Notes are given on the storage behavior of McIntosh, Jonathan, Delicious, Grimes, Rome, and Yellow Newtown apples. Oiled paper wraps proved very useful in controlling scald on susceptible varieties. Thinning experiments with several varieties of apples indicated that various factors, such as age of trees, vigor, varietal bearing habits, and market size demands, are involved. Thinning had no apparent effect on the biennial fruiting habit. Very little difference was noted between apples thinned at various dates up to June 7.

The results of miscellaneous variety tests with fruits, vegetables, and flowers are included.

[Horticultural investigations at the Kentville, N. S., Experimental Station, 1926], W. S. BLAIR (*Canada Expt. Farms, Kentville (N. S.) Sta. Rpt. Supt. 1926, pp. 17-50, 51-59*).—A comparison of Mazzard and Mahaleb stocks for the Montmorency cherry led to the conclusions that Mahaleb is the better stock for this variety. The trees on Mahaleb roots were more productive in the earlier fruiting period and maintained this supremacy. No difference was noted between the size of the fruits or the hardness of the trees on the two stocks.

Tests begun in 1913 upon the comparative value of different sized stocks for plums showed but little difference between the resulting trees in respect to yield or growth except in the case of the smallest sized stocks, which gave smaller trees and lesser yields.

The thinning of Wealthy apples resulted in better color, larger size, and less dropping at maturity. The total yield of thinned trees was slightly less, but the value of the fruit was considerably more. Results of spraying and dusting experiments with apples are given in detail and show the relative costs and

merits of various materials. Testing of fruit, vegetable, and flower varieties is reported in detail.

Chemical aids in rooting, A. LAURIE (*Amer. Florist*, 70 (1928), No. 2074, pp. 7, 30, figs. 4).—Certain chemicals were found at the Michigan Experiment Station to be useful aids in rooting cuttings, more from the viewpoint of hastening the process rather than increasing the final percentage of rooting. A 2 per cent cane sugar solution proved beneficial in the case of the carnation, lilac, climbing Euonymus, and heliotrope. A 0.1 per cent solution of potassium permanganate aided lilac, Euonymus, barberry, heliotrope, coleus, chrysanthemum, and carnation cuttings. Vinegar, 3 teaspoonfuls to a gallon of water, stimulated the growth of lilac, chrysanthemum, and Euonymus.

The chemical composition of insecticides and fungicides, R. H. ROBINSON and C. F. WHITAKER (*Oregon Sta. Circ.* 84 (1927), pp. 15).—In connection with the usual report (E. S. R., 54, p. 739) upon the results of the analyses of various insecticides and fungicides offered for sale in Oregon in 1926-27, the authors discuss the provisions of the Oregon economic poison act and the properties and uses of the principal spray ingredients.

The management of Michigan muck soils for the production of onions, P. M. HARMER (*Michigan Sta. Spec. Bul.* 168 (1927), pp. 48, figs. 14).—Beginning with a general discussion of onion production in Michigan—soils, liming, varieties, culture, harvesting, storage, pest control, etc., the author includes the results of experimental studies on onion fertilization in various parts of the State.

Stable manure failed to give as large yields as were obtained with a well balanced mixture of commercial fertilizers. Tests of materials containing various proportions of phosphoric acid and potash showed both ingredients to be essential. The results suggested that onion fertilization on muck soils involves a consideration of various factors, such as type and depth of the muck, how long used, time of planting, etc. For example, it was found that the ratio of phosphoric acid to potash should be higher on newly reclaimed muck than on used muck. Increasing the proportion of phosphoric acid to potash apparently hastened maturity, and hence is recommended for the late crop, especially on new soil. Readily available forms of nitrogen increased the yield of the early onion crop but were of less significance for the late crop. Tests of various sources of phosphoric acid showed that the readily available forms, such as superphosphate (acid phosphate) and treble superphosphate, were most valuable.

As regards the method of application, better yields generally resulted from application in the row, the results being modified by various factors, such as type of muck, previous fertilization, and moisture supply. Broadcasting the entire supply of fertilizer previous to planting was generally as satisfactory as splitting the application. The rate of profitable application ranged from 800 to 1,500 lbs. of fertilizer per acre.

A systematic study of the squashes and pumpkins, E. F. CASTETTER and A. T. ERWIN (*Iowa Sta. Bul.* 244 (1927), pp. 107-135, figs. 29).—Pointing out the distinguishing characteristics of the three *Cucurbita* species, *C. pepo* and *C. moschata*, the pumpkins, and *C. maxima*, the squash, the authors present a key to the annual cultivated species and list and describe the principal varieties within each species.

Studies conducted by the senior author show that the two pumpkin species, *C. pepo* and *C. moschata*, may be crossed and that *C. moschata* may be crossed with the squash, *C. maxima*, but *C. pepo* and *C. maxima* were almost intersterile. Group classifications for the varieties of pumpkin and squash are proposed.

Getting maximum results from sweet corn fertilizers, W. A. HUELSEN (*Canning Age*, 9 (1928), No. 4, pp. 309-312, figs. 2).—In studies at the Illinois Experiment Station applications of fertilizer in the hill were much more effective than broadcasting, as measured by the yields of sweet corn. Using a 0-16-6 (N-P-K) formula for all treatments, the maximum average yield from 400 lbs. per acre broadcast was 3.05 tons of green corn as compared with 3.35 tons for 100 lbs. in the hill. Under the conditions obtaining, 100 lbs. of fertilizer in the hill gave larger yields than did 150 or 200 lbs. The nonfertilized plats yielded at the rate of 2.71 tons per acre. At the time of maturity there was very little difference in appearance of plants on the several plats, indicating that yield differences can not be readily detected by mere inspection.

In respect to the time of ripening, as measured by the number of days between planting and full silk, the hill fertilized plants averaged from 1 to 3 days earlier than the plants in the broadcasted areas. The nonfertilized plants were latest of all.

Grading sweet corn seed for size, C. B. SAYRE (*Canning Age*, 9 (1928), No. 3, pp. 242, 243, 246, fig. 1).—Confirming the results obtained by Hoffman (E. S. R., 55, p. 836), the author reports that the grading of sweet corn seed at the New York State Experiment Station gave excellent results. No marked differences were noted at the time of germination, but 10 days later plants from large seeds were appreciably larger and more vigorous. At the time of tasseling the plants from large seeds were observed to be more uniform and further advanced, reaching the canning stage from 4 to 6 days sooner than plants from small seed. One picking sufficed for the graded lots. Graded seed had an added advantage of running through the planters more smoothly. The commercial application of the observations is discussed.

Making tomato plants wholly or in part independent of the soil for some of their mineral constituents, W. F. GERICKE (*Amer. Jour. Bot.* 14 (1927), No. 10, pp. 628, 629).—Treatment prior to transplanting to the field of Trophy tomato plants with various nutrient solutions indicated the possibility of accumulating in the plant a sufficient reserve of certain nutritive materials to influence subsequent yields greatly. In the present investigation, conducted by the University of California at Hayward, the yield of ripe fruit at the seventh weekly picking was for the untreated plants 11,220 lbs. and for the leading treated lot 20,544 lbs. per acre, the plants in both cases being spaced 6 by 6 ft.

The pectic compounds of watermelons and citron melons, J. T. ROSA (*Amer. Jour. Bot.*, 14 (1927), No. 10, pp. 631, 632).—At the University of California it was found that the total amount of pectic substances in the watermelon changes little during ripening, being about 0.085 per cent of the fresh and 1 per cent of the dry weight. Of the three forms, pectin, pectic acid, and protopectin, present, the pectin fraction was small and increased only slightly during ripening. Pectic acid was more abundant and increased decidedly. The insoluble protopectin fraction showed a corresponding decrease during ripening.

Studies upon the green-seeded citron melon showed more than six times as much total pectic substances as in the watermelon, with over half of the pectic substances occurring as pectin.

Growth and fruitfulness in dwarf fruit trees, A. SCHEULENBERG (*Wachstum und Fruchtbarkeit der Zwergobstbäume*. Stuttgart: Eugen Ulmer, 1927, pp. [2]+102, figs. 15).—Herein are presented the results of an anatomical and physiological investigation concerning the distribution and translocation of the carbohydrate reserves in the various parts of dwarf apple and pear trees.

Effect of the stock upon the fruit of apples [trans. title], W. MEIER (*Gartenwelt*, 32 (1928), No. 7, pp. 90, 91, fig. 1).—Differences were noted in the form, color, and flavor of Minister von Hammerstein apples harvested from

double-worked trees on different stocks. The fruits from dwarf trees, Gravenstein intermediate, were distinctly more oblate than those from dwarf trees, Kaiser Alexander intermediate, or from standard trees, unknown local sort, as intermediate.

Pruning the red raspberry, S. JOHNSTON and R. E. LOREE (*Michigan Sta. Spec. Bul. 162* (1927), pp. 23, figs. 8).—Investigations at East Lansing and South Haven with the Cuthbert raspberry indicated quite conclusively that the red raspberry requires only moderate pruning.

Studying the effect of pruning canes to various lengths, full (45 buds), breast high (33.2 buds), and waist high (20.4 buds), on the performance of the remaining buds, it was found that these treatments had little effect on the proportion of fruitful shoots, which was 62 per cent for average normal canes. The fifth to the tenth buds from the base were the most productive, with the tenth to the fifteenth next. From the fifteenth upward the average yield of the laterals progressively decreased. The size of the berries decreased gradually from the base to the tip of the cane. Large diameter canes were found markedly more productive than smaller ones, suggesting the value of cultural treatments favoring large canes.

Observations on the fruiting behavior of side branches showed the first five buds to give rise to a number of vegetative or barren shoots, the tenth to the fifteenth buds being the most productive; beyond this point yield and size declined rapidly. Although pinching the tips of new canes resulted in the formation of branches, it was observed that the new branches were extremely susceptible to winter injury.

Light heading in the spring of the fruiting year resulted in increased yields and also in greater ease in picking. Severe heading on the other hand decreased yields and increased harvesting difficulties by causing the development of dense vegetation. No pruning was observed to result in bending canes, causing more or less loss of ripe fruit. Thinning out the total number of canes to not more than 10 per 4 ft. of hedge row or 8 per hill gave good results, but greater thinning resulted in diminished yields. Thinning is deemed more important than heading, since an excess of canes per unit of row was found to reduce the size of the fruit. The degree of heading should correspond to the amount of available soil moisture.

Fresh grape shipments, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 26* (1928), No. 1, pp. 15-25).—As in the preceding year (E. S. R., 57, p. 140), Ohanez grapes were shipped quite successfully from Victoria, Australia, to London, England, and other points. No advantage accrued from treating the cork in which the grapes were packed. Of 18 varieties grown at the Rutherglen Viticultural Station and placed in cold storage the Ohanez was again the best keeping variety, followed by Henab, Purple Cornichon, Emperor, etc. The Muscat varieties were poor keepers due to a weakness of the skin near the pedicel. The paper wrapper and wood wool pack gave very satisfactory results as compared with cork and had the advantage of being much cheaper.

Valencia late oranges, G. B. TINDALE (*Jour. Dept. Agr. Victoria, 26* (1928), No. 1, p. 41).—Ethylene was found useful in coloring oranges which had turned green again from irrigation or unfavorable weather conditions, but did not prove successful in the coloring of immature fruit.

On the culture of hazelnuts of the Far East [trans. title], A. A. STROGII (STROGYI) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 18 (1927), No. 2, pp. 361-370; Eng. abs., p. 37).—Of two filbert species, *Corylus mandshurica* and *C. heterophylla*, mentioned in this article, the latter species is considered of value for culture on account of the character of its nuts.

The genus *Juglans* L. in Turkestan [trans. title], V. L. NEKRASOVA (NEKRASSOWA) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 18 (1927), No. 2, pp. 303-360, figs. 4; *Eng. abs.*, p. 630).—Among various walnut species found in Turkestan, *J. regia* occurs in a few gorges in the vicinity of Kopet-Dag, believed to be the northern limit of this species.

The Manchurian walnut (*Juglans mandshurica* Max.) [trans. title], A. A. STROGII (STROGYI) (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 18 (1927), No. 2, pp. 247-302; *Eng. abs.*, pp. 301, 302).—A discussion of the distribution, botany, and uses of the Manchurian walnut. This species is hardier than the Persian walnut (*J. regia*) and is deemed of value as a stock to extend this species northward. The Manchurian nut is believed capable of improvement by selection. From the immature nuts a jam is prepared, and from the mature nuts an edible oil is expressed. The tree has value for street planting and incidentally as a source of honey.

Storage experiments with gladiolus in Florida, W. L. FLOYD (*Gladiolus Rev.*, 5 (1928), No. 3, p. 99).—As determined by C. B. VanCleaf, under Florida conditions, from 42 to 45° F. proved more satisfactory than from 32 to 35° as a storage temperature for gladiolus corms. The plants from corms which had been stored at the higher temperature sprouted and blossomed on an average 1 week earlier. No difference was found in the time required to reach the blooming stage whether bulbs were 1, 2, 3, or 4 months in storage. No marked difference was observed between corms stored in ventilated boxes in an open shed and those held at from 42 to 45°. Size of corms within the limits of flowering size had no effect on the number of blossoms per spike. Northern-grown corms failed to produce as well as did Florida material.

Cold storage experiments in Illinois, F. F. WEINARD (*Gladiolus Rev.*, 5 (1928), No. 3, pp. 98).—Comparing storage temperatures of 38 and 60+° F., it was observed at the Illinois Experiment Station that gladiolus corms from the warmer storage sprouted some 10 days earlier but with only a slight difference in blooming time. Plants from the low temperature corms had about 10 per cent less blind shoots and averaged some 15 per cent more flowers. Small corms were generally inferior to first grade material. Attempts to induce the early breaking of the rest period by chemicals and light met with inconsistent results.

FORESTRY

A national program of forest research, E. H. CLAPP (*Washington, D. C.: Amer. Tree Assoc.*, 1926, pp. IX+232).—A report prepared by a special committee on forest research of the Washington section of the Society of American Foresters. Pointing out the great need of forest research, information is offered on the present status of research in forest management, forest protection, range management, wild life and recreation, forest economics, and the utilization of wood. The coordination of existing research agencies, both public and private, is urged.

Scheme for the development of forest research work in Finland [trans. title], L. ILVESSALO (*Silva Fennica*, No. 7, (1927), pp. 18; *Engs. abs.*, pp. 15-18).—A statement concerning the work and needs of the forestry service of Finland.

Water-content of seedlings and transplants in the nursery, E. V. LAING (*Scot. Forestry Jour.*, 41 (1927), pt. 1, pp. 26-35, fig. 1).—Studies at Aberdeen University, Scotland, with seedlings and transplants of Norway spruce, Sitka spruce, and European larch showed a marked increase in water content asso-

clated with the rising temperature in the spring and a decline associated with the cooling temperatures of late fall. The rise in water content began earlier in the larch than in either of the spruces. The older the seedling or transplant, the less were the seasonal variations in water content and the less the differences between the parts of the same plant. In respect to minimum water content the percentages in Norway and Sitka spruce shoots and roots, respectively, were never found below 100 and 170 to 180 per cent of the dry weight of the plants. Observations on the water loss of two 2-year-old transplants held in ordinary room temperature showed the most rapid loss in Norway spruce and the least in larch.

Nursery weeding: A new method of weed control in the nursery, E. C. DUTHIE (*Scot. Forestry Jour.*, 41 (1927), pt. 1, pp. 52-54, pls. 2).—Herein is briefly described a unique method of eradicating advance weed growth from forest seed beds by means of a blowtorch.

Notes on artificial extraction of seeds from cones of *Pinus longifolia* and *Pinus patula*, C. C. ROBERTSON (*So. African Jour. Sci.*, 24 (1927), pp. 320-327, pls. 2).—Studies at Pretoria, South Africa, to determine satisfactory and safe temperatures for drying pine cones showed that the seeds of the two species tested can endure rather high temperatures without loss of viability. *P. longifolia* seeds exposed for 2, 4, 6, and 8 hours to 150° F. dry oven heat germinated 96, 93, 95, and 96 per cent, respectively. Seeds taken from cones exposed for 4 days to 133° germinated 97 per cent. A temperature of 140° F. maintained for about 22 hours was apparently a safe treatment for *P. patula* cones. However, even at the higher temperatures the releasing of seeds was far from satisfactory.

The effect of size on germination and development of seed of sal (*Shorea robusta*), H. G. CHAMPION (*Indian Forester*, 55 (1928), No. 2, pp. 93-96, pl. 1).—The superior value of large-sized seeds was shown in greater germination and in better vegetative development of the resulting seedlings.

Reproduction of Adirondack white cedar by natural cuttings, W. M. HARLOW (*Jour. Forestry*, 26 (1928), No. 2, p. 244).—An examination of young plants growing near Cranberry Lake, N. Y., showed certain individuals to have apparently developed from natural cuttings which had rooted in the sphagnum moss.

More about living stumps, W. J. O'NEIL (*Jour. Forestry*, 26 (1928), No. 2, pp. 244, 245).—Life in an old hemlock stump, the tree top of which had been cut several years, was traced to a natural root graft with a root of a living tree standing some 30 ft. distant.

Dendrographic experiments: *Ocotea bullata* E. Mey. ("Stinkwood"), J. F. V. PHILLIPS (*So. African Jour. Sci.*, 24 (1927), pp. 227-243, figs. 4).—Investigations at the Forest Research Station, Deepwells, Knysna, upon the diameter growth in a 60-70-year-old tree showed daily reversible variations comparable to those observed by MacDougal in the United States (E. S. R., 55, p. 627). Permanent increment proceeded steadily throughout the year, lagging only in periods of unfavorable weather. No seasonal rhythm was recorded. Both artificial irrigation and the partial removal of the top tended to decrease the amplitude of the reversible variations. With the aid of fuchsin dye the author was able to ascertain that sap in *O. bullata* ascends in the second, third, fourth, and fifth growth rings, several of which may be formed in 12 months. There was no ascending stream in the current growth ring, which was characterized by a much higher sugar content than its adjacent neighbors. It is suggested that the denser wood of the second to fifth growth rings may act as a downward conductor.

Value of growth-rings in New Zealand mensuration studies, F. E. HUTCHINSON (*Te Kura Ngahere*, 2 (1926), pp. 5-10; also in *New Zeal. Jour. Sci. and Technol.*, 9 (1927), No. 4, pp. 240-247).—The radial growth ring measurement was found unreliable or of doubtful value for determining current or periodic increment in New Zealand trees with the exception of the beeches, *Nothofagus* spp. Permanent sample plates, deemed the only satisfactory means of determining tree growth, are recommended as a source of reliable data.

Notes on the characteristics and minute structure of thirty woods indigenous to South Africa, M. H. SCOTT (*So. African Jour. Sci.*, 24 (1927), pp. 298-317).—In addition to general descriptive material embracing color, weight, burning qualities, etc., detailed information is given on the gross and microscopic structure.

Factors in the frost resistance of the leaves of native Ohio evergreens, B. S. MEYER (*Amer. Jour. Bot.*, 14 (1927), No. 10, p. 624).—Determinations of the seasonal variation in the physical and chemical properties of the leaves of *Pinus rigida* and *Rhododendron maximum* showed an accumulation of colloidal gels and sugar during the winter months. The author believes that the colloidal gels are the principal factor concerned in increased winter resistance. Sugar content is thought to be a secondary factor in resistance, operating either through the protective action against protein precipitation or through the resultant increase in the osmotic pressure of the cell sap. The water content of the leaves showed but little change between winter and summer.

Growth, culture, and utility of the Austrian black pine and the Corsican pine in the Netherlands [trans. title], M. DE KONING (*Meded. Rijksboschbouw-proefsta.* [Wageningen], 3 (1927), No. 2, pp. 83-205, pls. 5, figs. 7; *Fr. abs.*, pp. 196-204).—Planted mostly along the seashore, where climate and soil distinctly favor their growth, the Austrian and the Corsican pines play an important rôle in Netherlands silviculture. Although generally found on calcareous soil, the Austrian pine thrives in the sandy acid soils of the seashore. Five or 6 years after planting the Austrian pine develops a sufficiently thick crown to prevent winds from moving the dune sands. The Austrian pine was found more resistant to severe ocean winds than the Corsican pine. On the other hand, the Corsican pine, on account of its long, straight trunk with less side branches, outyields the Austrian pine in timber. Among the disadvantages of the Corsican pine are low germination and low survival following transplanting into the permanent location.

Silvicultural treatment of mahogany forests in British Honduras, N. S. STEVENSON (*Empire Forestry Jour.* [London], 6 (1927), No. 2, pp. 219-227, pls. 3).—A brief account of practical methods developed for encouraging the reproduction of mahogany. The gradual removal of the undergrowth and the opening of the canopy by the destruction of less desirable species was found to favor seedling reproduction of mahogany greatly wherever there were adequate seed trees to supply seedlings for restocking.

America and the world's woodpile, R. ZON and W. N. SPARHAWK (*U. S. Dept. Agr. Circ.* 21 (1928), pp. 16, pl. 1, figs. 4).—Data are presented on the forest resources in the various important wood-producing regions of the world with a view to showing that the United States can not reasonably depend on foreign supplies to make up the prospective future lumber deficits. It is pointed out that the softwoods—that is, the coniferous species—are in great demand, and are largely limited to the cooler regions of the Northern Hemisphere. The vast tropical forests composed chiefly of hardwoods are relatively inaccessible and are not considered to be a potential source of cheap construction lumber. It is advised that the timber-growing resources of the United States be intelligently developed to meet the prospective shortage.

DISEASES OF PLANTS

[Plant disease investigations by the New York State Station] (*New York State Sta. Rpt. 1927, pp. 32-35*).—A survey of the diseases of canning crops was made in 1926. It is said that peas were not seriously damaged, and although *Ascochyta* blight was found in most areas the dry season did not favor its development. *Aphanomyces* sp., the cause of root rot, was found in most of the low or poorly drained soils. Other root rot organisms were observed, among them *Pythium* sp., *Fusarium* sp., *Mycosphaerella pinodes*, and *Ascochyta* sp. Unfavorable soil and weather conditions are said to have reduced the stands of peas and beans in many fields.

Leaf spots and *Fusarium* blight of tomatoes did not cause much loss in the year reported upon. Bacterial canker (*Aplanobacter michiganense*) caused extensive damage in one canning district.

Studies of the *Ascochyta* blight of peas are said to have shown that there were three species of *Ascochyta* associated with the disease. Tests of peas grown for seed are said to have shown that those produced in the semiarid regions of the United States were free from infection, while a large percentage of the seed produced east of the Mississippi River was infected. Seed badly infected with the *Ascochyta* organisms gave greatly reduced stands in comparison with those from healthy seed. Organic mercury dusts were found beneficial in increasing the stands of plants from either healthy or diseased seed.

Investigations of plant diseases on Long Island are said to show the beneficial effect of the hot water treatment for cabbage and Brussels sprouts seed; varietal resistance of cauliflower to mosaic; the control of cucumber wilt by dusting or spraying, if properly done; the control of bacterial rust of Lima beans by spraying before and after blossoming; and the control of scab and *Rhizoctonia* of potatoes by treating the tubers with the standard corrosive sublimate.

Investigations of lead arsenate injury to cherries and prunes and of the mosaic disease of raspberries have been noted (E. S. R., 56, p. 850; 57, p. 549).

Parasitism and development of *Colletotrichum omnivorum* [trans. title], A. AGOSTINI (*Riv. Patol. Veg.*, 16 (1926), No. 5-6, pp. 137-144).—*Aspidistra lurida* may contain normally in its leaves *C. omnivorum*, which, though normally saprophytic, is capable of behaving parasitically. This fungus and derivative or related forms are here dealt with.

A short study regarding the infection of seeds with smut spores [trans. title], N. P. OBERMEISTER (*Izv. Sev. Kavkazsk. Kraev. Sta. Zashch. Rast. (Bul. North Caucasian Plant Protect. Sta.)*, No. 2 (1926), pp. 43-45).—To determine the degree of infection 100 seeds were placed in a test tube, covered with 10 cc. of water, and shaken for five minutes. A definite amount of the resulting water suspension was placed under the microscope, then counts were made and calculated on the basis of the number of seeds. It was found that from 30 to 40 per cent of the seeds were infected with the smut spores.

The physical properties of fungicides [trans. title], T. L. DOBROZRAKOVA (*Zap. Leningrad. Sel'sk. Khoz. Inst. (Mém. Inst. Agron. Leningrade)*, 3 (1926), pp. 278-281).—In a discussion of the effectiveness of fungicides the author points out that the physical properties of the materials used and those of the leaves are of prime importance. The practical effectiveness of the sticking qualities of a fungicide depends on the structure of the leaf and on its form, surface covering, size, and position. The composition, concentration, and admixture of various substances influence the sticking qualities of the fungicide, and temperature and humidity are also factors. The two methods used in this preliminary study were (1) dipping a large number of leaves of various

plants and trees and then determining the wetting effects of the different fungicides, and (2) covering a certain leaf area with an atomizer and then calculating the drops that have coalesced and from the results the percentage of surface wetted.

A study of the influence of fungicides: The toxicity of fungicides [trans. title], M. F. MARKOVA (*Zap. Leningrad. Sel'sk. Khoz. Inst. (Mém. Inst. Agron. Leningrad)*, 3 (1926), pp. 270-277, figs. 2).—Following a discussion of the chemistry and the toxic properties of fungicides, the author presents data showing the influence of ferrous sulfate and of the double salt of ammonium and ferrous salt $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ on the conidia of *Erysiphe graminis* and the uredospores of *Puccinia dispersa*. The former are more sensitive to a given concentration of the fungicide. The ferrous sulfate is more toxic than is the double salt, due supposedly to the fact that the latter contains the $(\text{NH}_4)_2\text{SO}_4$ molecule which antagonizes the FeSO_4 .

Injury to glasshouse plants from hydrocyanic acid gas, following the application of copper fungicides, E. F. GUBA (*Phytopathology*, 16 (1926), No. 9, pp. 633, 634).—The incompatibility of copper fungicides and hydrocyanic acid fumigation in greenhouses is pointed out. In trials conducted in the greenhouse on cucumber and tomato plants treated with Bordeaux mixture, Pyrox, and copper-lime dust, all plants were injured equally following fumigation with hydrocyanic acid gas, while plants not so treated but exposed to the fumigant were unaffected. The author claims that where fungus diseases are of sufficient economic importance in the greenhouse to warrant the use of copper fungicides the cyanide fumigant should always precede the application of the copper by one or two days, or the use of the cyanide should be abandoned in favor of tobacco fumigants. Under no condition should cyanide fumigation immediately follow the application of copper fungicides.

Recent progress in the control of cereal smuts, W. H. TISDALE (*Phytopathology*, 16 (1926), No. 9, pp. 645, 646).—The author briefly summarizes the investigations by the U. S. Department of Agriculture and a number of experiment stations on the control of cereal smuts by the use of copper carbonate, organic mercury compounds, hot-water treatment, etc.

Wheat smut control by copper carbonate dust, I, II, T. D. HALL and W. S. H. CLEGHORNE (*Farming in So. Africa*, 1 (1926), No. 1, pp. 14, 15, 17, figs. 2).—The first of these sections is contributed by the chemist of the School of Agriculture and Experiment Station, Potchefstroom, and the second is by the agricultural engineer of that school.

I. The system, T. D. Hall (pp. 14, 15).—A summary of the results of investigation said to have been carried out by G. F. Puttick states that the copper carbonate method is the best for wheat smut control. The advantages of this method are detailed. About as good control was obtained from a copper carbonate preparation containing 20.43 per cent of copper as from pure copper carbonate containing 56.6 per cent copper.

II. Seed dusting machines, W. S. H. Cleghorne (pp. 15, 17).—The construction, adjustment, operation, and advantages of machines are briefly indicated.

Effects of wheat treated with copper carbonate upon the common house mouse (*Mus musculus*), W. W. MACKIE and F. N. BRIGGS (*Phytopathology*, 16 (1926), No. 9, pp. 629-632, figs. 2).—In a previous publication it was shown that copper carbonate prevented insect attack in stored grain (*E. S. R.*, 53, p. 52). Additional experiments were conducted to determine whether copper-carbonate dust is poisonous to mice or acts as a repellent. It was found that copper carbonate caused no apparent injury to mice when consumed by them on wheat as ordinarily treated to control bunt. When untreated wheat is available mice

will avoid wheat treated with copper carbonate. So far as the effect on mice is concerned, copper carbonate is considered a repellent and not a poison.

Black point of wheat grains [trans. title], M. CURI (Riv. Patol. Veg., 16 (1926), No. 5-6, pp. 125-136).—Noting a statement by Peyronel to the effect that *Cladosporium herbarum* was not the exclusive cause of wheat grain black point (E. S. R., 57, p. 841), the author reports in this connection what is thought to be a new *Alternaria*. This is herein technically described as *A. peglionii* n. sp. The disease is said to be very common throughout Italy, even in the best selected wheats. This "puntatura" is not to be confused with a somewhat similar trouble produced by *Bacterium atrofaciens* or else by *Helminthosporium sativum*.

Breeding wheat for resistance to physiologic forms of stem rust, O. S. AAMODT (Jour. Amer. Soc. Agron., 19 (1927), No. 3, pp. 206-218).—Crop improvement as concerned with disease resistance considers the possible existence of physiologic forms of the pathogenic organism, the need of a survey to determine the prevalence and distribution of the various forms, the varietal reactions of the hosts to particular forms, the reactions between host and parasite as definite genetic characters, and the possibility of combining the resistance to all forms within a single desirable commercial variety.

Studies of species crosses are said to have demonstrated that stem rust resistance can be transferred from the durumms and emmers to common wheats. A greenhouse test is thought necessary to determine the mode of inheritance of the reaction of a variety or hybrid to particular physiologic forms. A field test is necessary in order to determine more fully and accurately varietal reaction to rust under the particular environmental conditions in the locality in which the variety is to be grown. Genetic evidence has been obtained regarding the mode of inheritance of resistance in wheat to many physiologic forms of stem rust. Some varieties are already available which show fairly high rust resistance and good milling quality and it is thought probable that better and more highly rust-resistant varieties can eventually be obtained.

Sulphur dust for rust control, C. G. SELVIG (Minnesota Sta., Crookston Substa. Rpt. 1926, pp. 27, 28).—Previous experiments having shown that under certain conditions sulfur dust controlled stem rust of wheat (E. S. R., 56, p. 544), tests were made of 2 commercial forms of sulfur, Kolodust (a colloidal form) and Anchor Brand (flowers of sulfur), applied at the rate of 150 lbs. per acre. Kolodust was the most satisfactory, the flowers of sulfur failing to control the rust effectively. Three or more dustings with Kolodust controlled the rust sufficiently for all practical purposes, and 2 dustings greatly reduced the amount of rust and delayed its appearance. Even one dusting appeared to delay the appearance of the rust. The best results were obtained when the first dust was applied at blossoming time and the most satisfactory period between dustings seemed to be from 5 to 7 days. The yield from plats indicated an increase of 30 per cent due to the use of the sulfur dust.

It is claimed that, in general, the experiments indicate 2 or 3 dustings with Kolodust would be necessary to secure rust control under farm conditions, but this would be impractical at the rate the dust was applied in these experiments.

Sulphur dust for rust control, A. A. DOWELL (Minnesota Sta., Crookston Substa. Rpt. 1927, pp. 16, 17).—Additional data are given on the control of wheat stem rust by dusting with Kolodust (see above), the experiments being directed to the reduction of the amount of sulfur applied. The tests involved rates, number, and times of dusting, first and last dates for successful use, effect on spikelet sterility, etc.

The complete results are said to be unavailable, but from the data on hand it appears that 3 dustings were generally effective. It is believed that this number will be required for practical field work. Although increased rates of application showed slightly better control, it is considered probable that 30 lbs. per acre, or possibly 15 lbs. for each dusting, may be practical. Dusting wheat with sulfur at blossoming time did not interfere with pollination and cause sterility.

In field trials increased yields were obtained as follows: From 3 dustings 26.1 bu. and from 4 dustings 27.5 bu., as compared with 23 bu., undusted.

The development of the perithecium of *Ophiobolus graminis*, Sacc., S. G. JONES (*Ann. Bot. [London]*, 40 (1926), No. 159, pp. 607-629, pls. 2, figs. 8).—The fungus *O. graminis* is here dealt with principally as the cause in Wales of a disease of oats, which show empty glumes and haulms dead to the roots, though still rigid and erect. As soon as the bleached condition becomes apparent, the fungus growth can be found on the roots and basal internode and inside the sheath as a coarse web of a dark brown chitinous mycelium. The penetrating and intracellular mycelium consists of uninucleate cells and develops no haustoria. Spermatogonia and spermatia are formed, but are thought to be functionless. The structure, development, and function are given in some detail. The phenomenon of spore discharge is described. It is suggested that the genus *Ophiobolus* can be transferred from the Pleosporaceae to the Gnomoniaceae.

Observations on corn smut at Akron, Colorado, F. A. COFFMAN, W. H. TISDALE, and J. F. BRANDON (*Jour. Amer. Soc. Agron.*, 18 (1926), No. 5, pp. 403-411).—During 1920-1923, data were obtained on some factors influencing infection of corn by smut (*Ustilago zeae*) at the U. S. Dry-Land Field Station, Akron, Colo.

The smut percentages vary in different seasons. Scanty May and June precipitation, followed by moderate rainfall and comparatively high temperatures, apparently favors the disease, as in 1921. Moderate precipitation throughout the season with high July and August temperatures seems to favor moderate infection, as in 1922. July and August showed the most abundant smut in all years. Varietal differences as regards infection were found, and selection lowered infection. Some strains of Swadley corn showed marked and constant differences in resistance. Ear-row progenies from the same parent ear row in some cases showed marked differences in smut susceptibility, while in other cases they were very similar, all strains showing either high or low percentages of smut. This it is thought may prove of some practical value in breeding smut-resistant strains of corn.

On two obscure diseases of cotton, G. H. JONES and T. G. MASON (*Ann. Bot. [London]*, 40 (1926), No. 160, pp. 759-772, pl. 1, figs. 6).—In this account of two rather obscure diseases of the cotton plant in Nigeria, the name leaf curl, credited to Farquharson (*E. S. R.*, 29, p. 749), has been retained for a disease said to be especially prevalent on indigenous cottons (*Gossypium peruvianum* and *G. vitifolium*) and present on American cotton (*G. hirsutum*). The histological modifications that characterize leaf curl show a striking resemblance to the abnormalities that accompany virus diseases. The disease appears to be transmissible by budding, though infection has not been obtained by inoculation with the sap of diseased plants nor by jassids. The incidence of leaf curl is particularly pronounced in the spring.

The term "leaf roll" is suggested for a disease discovered on American cotton, on which it is more prevalent than on the indigenous species. This disease, which is described, is not infectious. The most important predis-

posing environmental factor is the direct one of excessive soil humidity, and not the indirect effects (root asphyxiation, leaching of solutes) that accompany an excessive quantity of soil water. The disease has not been noticed in plants growing under heavy shade. Diseased plants recover and produce normal healthy foliage when dry conditions are restored.

Inoculation experiments with *Nematospora gossypii*, Ashby and Nowell, R. W. MARSH (*Ann. Bot. [London]*, 40 (1926), No. 160, pp. 883-889).—It is claimed to have been shown that *N. gossypii* is unable to attack unpunctured cotton bolls, to injure mature cotton fibers, or to destroy cellulose under experimental conditions. The injury caused by the growth of a pure culture of this fungus in the developing lint is not a destruction of the existing cell walls, but appears to be an interference with the subsequent growth and maturing of the cotton hairs, this effect being marked by staining, arrested development, and, probably, premature death of the hairs. Staining, a pathological modification of the cell contents, is produced only as a reaction of living hairs, and many agencies other than *N. gossypii* are able to bring about this effect. A few bolls were infected with pure cultures of *Spermophthora gossypii* and of *N. coryli*, and the effect of these organisms on the developing lint was similar in all respects to that produced by *N. gossypii*.

A comparative study of the feeding methods of certain Hemiptera and of the resulting effects upon the plant tissue, with special reference to the potato plant, K. M. SMITH (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 109-139, pls. 4, figs. 10).—The study here outlined was first commenced in 1921, dealing with the activities of several groups of Hemiptera chiefly in relation to the potato plant. A discussion is appended on the relation of the facts set forth to the question of the transmission of virus diseases of the potato by such sucking insects.

Influence of the environment on potato mosaic symptoms, C. M. TOMPKINS (*Phytopathology*, 16 (1926), No. 9, pp. 581-610, pls. 5, figs. 6).—A study is reported of the influence of air temperature, soil temperature and soil moisture, humidity, light, and nutrition as influencing the systems of mosaic of Wisconsin Triumph potatoes. Many of the experiments were conducted in the greenhouses of the Wisconsin Experiment Station, but some were supplemented by plantings made at high elevations in Colorado.

Air temperature was found to be the main and only factor affecting the amount and intensity of symptoms on potato foliage under greenhouse conditions. Experiments conducted in constant air-control chambers indicated that relatively short exposures to air temperatures above that of the critical air temperature (23 to 24° C.) were sufficient to mask the symptoms of mosaic, the rate of masking being dependent on the duration of exposure, upon the air temperature, and upon the age of the leaves. Masked mosaic plants subjected to low air temperatures always redeveloped characteristic symptoms of mosaic. It was found that high soil temperatures were of importance in masking mosaic plants during the earlier stages of growth, regardless of the moisture content of the soil or air temperature. The effect of soil moisture, humidity, light, and variation in fertilizers failed to decrease or intensify the symptoms of mosaic potato plants. Histological studies showed marked deviation in the structure of masked leaves from healthy ones. The time and duration of the period of masking were found to vary in different potato-producing regions.

The author calls attention to the necessity of providing intermittent air temperatures in experiments connected with the tuber-index method of testing seed potatoes and in investigations of mosaic.

Potato tracheovorticilliose in Italy [trans. title], M. CURZI (*Riv. Patol. Veg.*, 16 (1926), No. 3-4, pp. 77-84).—A paling and wilting of potato plants was

found to be associated with the presence in the vessels of a mycelium which appeared to resemble that of *Verticillium albo-atrum*. Studies regarding the identity of the fungus are indicated, in which other species of *Verticillium* were considered.

The viability of the winter sporangium of *Synchytrium endobioticum* (Schilb.) Perc., the organism causing wart disease in potato, M. D. GLYNNE (*Ann. Appl. Biol.*, 13 (1926), No. 1, pp. 19-36, fig. 1).—A staining method is described for testing the viability of the winter sporangia of *S. endobioticum*, and a method is described whereby sporangia which have been treated in soil may be extracted without affecting their viability. It is stated that all the sporangia are killed by treatment for 5 minutes at 90° C., 15 minutes at 80°, 1 hour at 70°, or 8 hours at 60°.

On the nature of the resistance of the potato to wart disease, K. CARTWRIGHT (*Ann. Bot. [London]*, 40 (1926), No. 158, pp. 391-395, pl. 1).—Study of the susceptible potato varieties Arran Chief, Midlothian Early, and Ninety Fold and of the immune varieties Great Scot, Tinwald Perfection, Edzell Blue, and Kerr Pink showed no anatomical difference between the young shoots of varieties of potato respectively immune and susceptible to wart disease. Temperature changes showed very little effect on the degree of infection. Infections were obtained from temperatures varying from 58 to 80° F., the healthiest tubers taking the disease most readily and the most satisfactory infections being made with tubers kept under normal conditions.

Zoospores of *Synchytrium endobioticum* were found capable of penetrating the epidermal cells of young shoots of the immune variety Great Scot. For the first two days the development of the organism in immune varieties appears normal, and the organism grows and travels down the cell as in susceptible varieties. Afterwards it becomes smaller and less definite in outline, showing signs of disorganization. It appears finally to be dissolved and so disappears from the host cells. The resistance of this immune variety is not deemed due to a capacity to prevent the entry of the invading parasite, but to some physiological characteristic of the epidermal cells which causes the death of the invading organism after it has entered.

[Potato disease control at the Crookston Substation], C. G. SELVIG (*Minnesota Sta., Crookston Substo. Rpt.* 1926, pp. 37-39, fig. 1).—Continuing experiments on the control of Rhizoctonia or black scurf (*E. S. R.*, 56, p. 547), comparisons were made of treating tubers before and after cutting with hot formaldehyde and corrosive sublimate and before cutting with potassium permanganate solution. The lots treated with hot formaldehyde gave the lowest percentage of disease, followed by the corrosive sublimate lots treated before cutting. Potassium permanganate was not efficient in controlling the disease.

Cooperative experiments in which badly infected tubers were treated with corrosive sublimate and Semesan, with and without hydrochloric acid, and hot formaldehyde showed that while there were no very striking differences in yield, yet when averaged the corrosive sublimate treatment compared favorably with the hot formaldehyde treatment, and the treatment consisting of a 5-minute soak in corrosive sublimate (1-500) plus 1 per cent hydrochloric acid appeared to be the best.

Spraying experiments with Bordeaux mixture were continued to determine the relative efficiency of early and late sprayings for the control of leaf diseases and insects. Five sprayings at from 10 to 12 day intervals after the potatoes were 8 in. high were applied. The results of the experiment indicate that in seasons such as 1926 early applications of Bordeaux mixture are essential, and that 4 or 5 applications may be necessary for the best control.

[Potato disease control at the Crookston Substation], A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpt. 1927, pp. 32-36*).—Three sprayings with 4-4-50 Bordeaux mixture are said to have increased the yield of Early Ohio potatoes by 122 bu. per acre and Green Mountain potatoes by 94 bu. Two additional sprayings in August were of no advantage.

Further tests are reported on the treatment of seed tubers with hot formaldehyde, corrosive sublimate, acidulated corrosive sublimate, Semesan Bel, etc., for the control of *Rhizoctonia* and common scab. Ranking the seed treatments in order of the percentages, corrosive sublimate before cutting produced 47.5 per cent of disease-free tubers; hot formaldehyde before cutting, 42.2; corrosive sublimate after cutting, 39.5; acidulated corrosive sublimate, 30.45; hot formaldehyde after cutting, 30.2; Semesan Bel, wet, 28.8; and Semesan Bel, dust, 28.3 per cent.

Cooperative tests on seed treatments showed in one series that the best control was secured by the standard corrosive sublimate treatment, and corrosive sublimate acidulated with citric acid. Lots treated with Semesan Bel are said to have increased the yield more than other lots treated with formaldehyde.

[Sugar cane diseases], J. KUYPER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 23, pp. 970-975*).—An account is given regarding several sugar cane diseases, their varietal incidence, and treatment.

Studies on the aetiology of sugar-cane froghopper blight in Trinidad.—I, Introduction and general survey, C. L. WITHERCOMBE (*Ann. Appl. Biol., 13 (1926), No. 1, pp. 64-108, figs. 4*).—The author considers here at length only the conditions influencing resistance and recovery from attack by the cane blight due to the froghopper, which is a serious pest in Trinidad, though dealing with the blonemics of the froghopper. The saliva of the froghopper is slightly acid, containing amylolytic and oxidizing enzymes. The effect of the froghopper sucking the cane leaf is described, particularly as to the peculiar and primary effects upon the border parenchyma. Later spread is detailed, and influences are considered. Apparently, the water relations of the plant are highly important in connection with recovery and the spread of the injury. Great abundance of froghoppers, apart from the condition of the cane, insures serious injury. The importance of water relations is emphasized.

Sugar cane mottling and leaf lice [trans. title], P. J. VAN BREEMEN (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 23, pp. 910-912*).—Information is given regarding the correlation between the occurrence of leaf mottling (which is not to be confounded with chlorosis) and the presence of *Aphis maidis*, which was at a maximum in December, 1924, and again in January and February, 1926.

[Sereh and mottling in sugar cane], J. KUYPER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 23, pp. 949-955*).—An account is given of sugar production conditions, with more particular reference to sereh (*Bacterium vascularum*) and mosaic (*Aphis maidis*, carrier).

[Sugar cane rots], T. A. TENGWALL (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 23, pp. 930-937*).—Three forms of rot are indicated, the most typical of which is ascribed to insufficient drainage. Varietal relations are detailed.

The leaf sheath fungus *Nigrospora panici*, a form of *Melanconium sacchari* [trans. title], G. BREMER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 22, pp. 885-896, pls. 2, figs. 5*).—The fungus *N. panici*, a form of *M. sacchari*, on leaf sheaths of sugar is said to be entirely harmless.

On a *Rhizoctonia* disease of *Vigna* [trans. title], J. GANDRUP (*Arch. Rubbercult. Nederland. Indië*, 9 (1925), No. 4, pp. 465-473, figs. 2; *Eng. abs.*, p. 473).—On east Java rubber estates *V. oligosperma* (*V. hosei*), grown as a ground cover, is attacked and in some cases largely destroyed by a wet rot disease during the rainy season. The attack is severe on the leaves, which are decomposed into a slimy mass. Young twigs are also attacked, older ones but rarely. The disease is caused by a *Rhizoctonia* species as yet undetermined. *Centrosema pubescens* was also attacked by a *Rhizoctonia*, though in less degree.

Further experiments in the control of watermelon anthracnose with dusts and sprays, O. C. BOYD (*Phytopathology*, 16 (1926), No. 9, pp. 641, 642).—In continuation of previous suggestions (*E. S. R.*, 55, p. 548), an account is given of experiments in which comparisons were made of Bordeaux mixture 4-8-50 and homemade and commercial copper-lime dusts for the control of watermelon anthracnose in Georgia. The sprayed vines retained more fungicide per unit of copper applied than the dusted vines, and the spray deposit was more resistant to washings by rain than the dusts. The spray mixture gave slightly better control on the leaves than the dusts, with a doubtful difference as to the melons. The net returns from the different treatments were \$25.57 for the untreated plats, \$67.37 for those sprayed with Bordeaux mixture, \$58.38 for the homemade dust, and \$36.70 for the commercial copper-lime dust.

The fungi of stigmatomycosis, S. F. ASHBY and W. NOWELL (*Ann. Bot. [London]*, 40 (1926), No. 157, pp. 69-83, pls. 2).—This paper, listing related literature, discusses the characters of *Spermophthora gossypii* n. g. and sp., *Eremothecium cymbalariae*, *Nematospora gossypii* n. sp., and *N. coryli*, commonly occurring in the British West Indies in connection with stigmatomycosis of fruits, in which fruits externally sound are internally infected as a result of punctures by Heteroptera.

Species of *Nectria*, *Gibberella*, *Fusarium*, *Cylindrocarpon*, and *Ramularia* occurring on the bark of *Pyrus* spp. in Oregon, S. M. ZELLER (*Phytopathology*, 16 (1926), No. 9, pp. 623-627, figs. 3).—In connection with his study of the European canker of pomaceous fruit trees (*E. S. R.*, 55, p. 452), the author collected other fungi associated with or related to *N. galligena*, the cause of European canker. The following species are listed as occurring on apple or pear trees: *N. cinnabarina*, *N. galligena*, *N. sanguinea*, *G. baccata*, *G. moricola*, *F. acuminatum*, *F. bulbigenum*, *F. graminum*, *F. herbarum*, *F. oxysporum*, *F. polymorphum*, *C. angustum* n. sp., and *R. obtusispora*.

C. angustum, a new species, is described by Wollenweber.

Spraying for control of bacterial spot of peach, H. W. ANDERSON (*Ill. State Hort. Soc. Trans.*, 60 (1926), pp. 147-154).—In a continuation of statements previously noted (*E. S. R.*, 53, p. 549; 56, pp. 241, 453), the author states that at Ozark, Ill., in 1926, sodium silicofluoride (2 lbs. to 50 gal. of water) applied at shuck fall and followed after 3 weeks with reapplications at intervals of 10 days or 2 weeks until July 23 effectively controlled the bacterial fruit spot.

Slightly better control was obtained by combining Ialine (a colloidal sulfur) with sodium silicofluoride when applied as above indicated. Dritomic sulfur with sodium silicofluoride also gave satisfactory control.

At Urbana weekly applications of sodium silicofluoride between June 21 and July 31 resulted in almost perfect control of the disease on the fruit and a material reduction in leaf infection. The foliage injury, which appeared in all experiments, was not sufficient to cause serious concern. The premature ripening of the fruit, which was noticed both at Urbana and Ozark, is thought to be one of the most serious objections to the use of this material. None of the spray materials ordinarily used on peach gave any measure of control.

Solubility of Bordeaux mixture by green organs of the grape [trans. title], E. CERASOLI (*Riv. Patol. Veg.*, 16 (1926), No. 1-2, pp. 17-19).—The chemistry of copper sprays, particularly of basic copper sulfate, is discussed with regard to the solubility of the products of chemical change indicated.

Grape disease control in Delaware, T. F. MANNS (*Delaware Sta. Bul.* 154 (1928), pp. 37, figs. 12).—A report is given of 5 years' experiments on the control of grape diseases. The investigations were conducted mainly for the control of black rot, although other diseases, such as anthracnose, bitter rot, dead arm, and ripe rot, were included, and the previous conclusions relating to early infections and sprayings (E. S. R., 52, p. 843) were confirmed.

The diseases were found to be carried over from year to year on the new wood at the end of the growing season, and reinfection took place on the new growth on the first 7 or 8 internodes before the growth was 5 in. long. Delayed dormant sprays, applied when the new growth was from 0.5 to 0.75 in. long, prevented the carry-over infection. Sprays applied when the growth was from 5 to 7 in. long failed to control the carry-over, and it is claimed that the delayed dormant spray must be included in the spray program if the source of disease infection is to be eliminated.

Black rot dissemination was heaviest, 4 seasons out of 5, during the blossoming period. If the preblossom spray was omitted the disease was not controlled on the fruit. Bordeaux mixture applied just before blossoming was found efficient for the prevention of black rot infection during the blossoming period. Five applications, beginning with a delayed dormant spray, controlled black rot, anthracnose, bitter rot, dead arm, and ripe rot on the varieties Concord and Moore Early. A late application for the control of downy mildew was necessary in certain seasons.

The cause of the persistent development of basal shoots from blighted chestnut trees, A. H. GRAVES (*Phytopathology*, 16 (1926), No. 9, pp. 615-621, fig. 1).—Attention is called to the fact that when the main trunks of chestnut trees are killed by *Endothia parasitica* usually several successive generations of basal sprouts appear which may develop for a considerable time.

Comparative inoculations on roots and shoots of the American chestnut are said to have demonstrated that the root tissues, including the region of the root collar, are far more resistant to the growth of *E. parasitica* than are the stem tissues. The greater resistance of the root tissues is considered to be due, in part at least, to their greater content of tannin compounds or of substances associated with tannin. The resistance of the root and root-collar tissues is believed to be the cause of repeated generations of sprouts from blighted trees. The shoots are said to have developed from adventitious buds in the region of the root collar, utilizing at first the root of the old tree, but in time developing their own roots. Ordinarily these shoots are said to die of the blight, but others appear, and in this way a succession of crops is developed.

The future of the chestnut as an orchard, ornamental, and forest tree in the southern Appalachians, G. F. GRAYATT (*Phytopathology*, 16 (1926), No. 9, pp. 643, 644).—The spread of chestnut blight in the South is said to threaten the native species of chestnut, and experiments have shown that the chinquapin is also subject to attack. Planting some of the more resistant strains of the Japanese chestnuts and the hairy Chinese chestnut is recommended.

The pecan scab fungus, J. B. DEMAREE (*Phytopathology*, 16 (1926), No. 9, pp. 642, 643).—The author claims that the fungus which causes pecan scab and is usually referred to as *Fusicladium effusum* does not belong to that genus, but is a *Cladosporium*. In its morphological characters the fungus is said to resemble *C. carpophilum*.

Report on the experiment of 1925 for pecan scab control at Baconton, Ga., O. C. BORN (*Phytopathology*, 16 (1926), No. 9, pp. 644, 645).—A report is given of experiments conducted to compare the effectiveness of various fungicides for the control of pecan scab.

Sixteen-year-old trees of the varieties Delmas, Schley, and Alley were sprayed or dusted with Bordeaux mixture 4-8-50, monohydrated copper sulfate lime to which Kayso was added, a commercial copper-lime dust without the sticker, and a Bordeaux dust which was claimed to carry an electrical charge. Five applications of the spray were made, and 9 of the dusts.

Although the protection program was not begun until 3 or 4 weeks after scab appeared on the young leaves, the dusts held the disease in satisfactory control throughout the season on Alley and Schley but were less effective on the Delmas variety. On all varieties the spray mixture produced a higher degree of control than any of the dusts. All of the untreated Delmas trees lost 100 per cent of their nuts from scab, while those sprayed with Bordeaux mixture lost about 2.9, those dusted with home-mixed preparation 21.2, the commercial copper-lime dust 54.6, and the Kil-Tone Bordeaux dust 68.7 per cent.

Nematode leaf disease of chrysanthemums in Moravia, 1925 [trans. title], J. ROZSYPAL (*Centbl. Bakt. [etc.]*, 2. Abt., 68 (1926), No. 8-14, pp. 179-195, *figs.* 2).—In a report from the Moravian Agricultural Research Institute at Brunn, the author gives an account of injury ascribed to the chrysanthemum nematode *Aphelenchus ritsemabosi*, said to be widespread in Moravia.

A corm rot of gladiolus caused by a *Penicillium*, L. MCCULLOCH and C. THOM (*Science*, 67 (1928), No. 1730, pp. 216, 217).—A description is given of a corm rot of gladiolus that is said to be characterized by firm but not hard, sunken, reddish-brown lesions. The rot is said to invade the corm tissues rather rapidly at temperatures between 12 and 23° C., eventually destroying the corm. Scanty development of the fungus was observed at temperatures above 20°. The causal organism, *P. gladioli* n. sp., is technically described, and it has been identified in material grown in the Netherlands, New Mexico, Canada, Kansas, and New York.

The pathogenic capacities of fungi causing anthracnose of orchids [trans. title], R. CIFERRI (*Riv. Patol. Veg.*, 16 (1926), No. 1-2, pp. 1-16, *pl.* 1).—The author lists 25 *Gloeosporium*s (species or subspecies) and 11 *Colletotrichum*s on orchids, with discussion in connection with results of infection tests.

A bacterial soft rot of garden poppy, C. S. R. AYYAR (*India Dept. Agr. Mem., Bact. Ser.*, 2 (1927), No. 2, pp. 29-33, *pls.* 3).—In 1916, opium poppy plants (*Papaver somniferum*) from an experimental plat at Cawnpore showed a disease similar to that caused by *Bacillus solanacearum* in tobacco, the symptoms being a blackening in the early stages of leaf midribs and complete rotting of the plant in the advanced stage. The organism, which was isolated, made to produce the disease by inoculation, and reisolated, is considered a new species and is designated by the name *B. papaveris*.

Elm disease in Bonn [trans. title], COUNTESS VON LINDEN and L. ZENNECK (*Centbl. Bakt. [etc.]*, 2. Abt., 69 (1927), No. 15-24, pp. 340-351).—In Bonn and elsewhere elms are subject to a killing disease, which is here described. The disease has been thought to be connected with a member of the Stilbaceae. A second view is that *Micrococcus ulmi* causes the trouble, while a third assumption is that various climatic influences primarily reduce resistance in sensitive elms and thus condition the disease. In the studies outlined the stage supposedly belonging to the Stilbaceae did not develop, though *Graphium ulmi* was observed in the cultures.

Verticillium-wilt of maple and elm-seedlings in Holland, J. H. H. VAN DER MEER (*Phytopathology*, 16 (1926), No. 9, pp. 611-614, pl. 1, fig. 1).—A wilt of young maple trees and elm seedlings caused by *V. dahliae* is described. The disease on maple is said to be characterized by defoliation and death of branches, the production of suckers and cankers, and a brown-green discoloration of the wood. The elm seedlings are said to be stunted and partially defoliated, and the wood becomes brown. Gumlike substances and mycelium were found in the vessels of the diseased wood.

Investigations on the movement of latex in the latex vessels [trans. title], W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië*, 9 (1925), No. 12, pp. 913-936, figs. 2; *Eng. abs.*, pp. 935, 936).—Movement of latex within the intact vessels of *Ficus vogelii* has been studied. This movement depends upon the physical and chemical conditions and changes in the latex vessels, every change in the protoplasm, even of the neighboring cells, causing movement through alterations in the tension to which the latex is subjected. Continual change occurs in the water content and consequent tension. Tension decrease is more important than increase. Latex movement in an intact plant is temporary and has no great physiological importance.

Investigations on the respiration of Hevea brasiliensis [trans. title], W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië*, 9 (1925), No. 8, pp. 665-678; *Eng. abs.*, p. 678).—Respiration in *H. brasiliensis* is found to be normal, its intensity depending upon the development stage of the organs. Intramolecular respiration, which also occurs normally, is accompanied by the formation of alcohol. The relation of $\text{CO}_2:\text{CH}_3\text{CH}_2\text{OH}$ and that of I:N (intramolecular to normal) remain almost similar under different circumstances.

"The presence of latex does not have an influence upon the course of respiration, while the caoutchouc does not serve as material for the respiration. The caoutchouc changed neither at the intramolecular respiration nor at the different conditions of the plant. The latex of *Hevea* chiefly consists of excretion material according to former investigations. Investigations on the respiration affirm these results."

Investigations on the H-ion concentration of Hevea brasiliensis [trans. title], W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië*, 9 (1925), No. 4, pp. 474-482, figs. 2; *Eng. abs.*, p. 482).—Estimation of the H-ion concentration in *H. brasiliensis*, colorimetrically in the expressed juice and microscopically in sections, gave only approximate results from the second method. As the organs age the pH in the juice approaches the point of neutrality. Young offshoots show pH 5.3 in the juice, the old falling leaves pH 6.4. In the expressed juice of the bark from different trees the pH varies from 5.1 to 5.8. Intensive tapping alters the bark reaction from its normal position near neutrality in the direction of acidity. The fact, shown by microscopical observations, that the cells surrounding the latex vessels and sometimes also those of the medullary rays have a strongly acid reaction ($\text{pH}\pm 4.4$) may indicate that the principal action with which latex formation is connected occurs in the cells that surround the latex vessels. This view harmonizes with the fact that starch granules have accumulated in the cells around the latex vessels.

"The high acidity of the cells around the latex vessels affirms the supposition that amylum is the principal compound from which the latex (caoutchouc) originates."

On the occurrence of Ganoderma lucidum on rubber areas [trans. title], O. VAN OVEREEM (*Arch. Rubbercult. Nederland. Indië*, 9 (1925), No. 5, pp. 518-521, 526, pls. 3; *Eng. abs.*, p. 526).—On areas indicated, both *Hevea* sp. and *Cassia stamea* show outgrowths of *G. lucidum*, which is said to be a wound parasite.

Loss may be lessened by minimizing injuries and treating wounds. Old stumps are centers of infection and should be destroyed.

Negative results obtained by the use of paradichlorobenzene against the root-nematode, *Heterodera radicola*, H. R. ROSEN (*Phytopathology*, 16 (1926), No. 9, pp. 635, 636).—Attempts were made to destroy nematodes in sandy soil in pots by placing in each 6-in. pot 0.25 oz. of paradichlorobenzene, but the treatment failed to kill the nematodes, root knots appearing on the tomato plants subsequently grown in the treated pots. Germination was severely reduced, and injury to roots due to the treatment was noticed. Later the pots were allowed to dry out for two months and again seeded, but nematodes again appeared on roots of plants in the treated soil.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Amendments to the regulations respecting game animals, land fur-bearing animals, game birds, nongame birds, and nests and eggs of birds in Alaska (U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comm. Circ. 4 (1928), pp. 4).—These are amendments to the regulations previously noted (E. S. R., 57, p. 552).

Studies on the economic importance of the European mole (*Talpa europaea*) [trans. title], F. HAUCHECORNE (*Zitschr. Wiss. Biol., Abt. A, Zitschr. Morph. u. Ökol. Tiere*, 9 (1927), No. 3-4, pp. 439-571, figs. 6).—An extended account of studies of this mole is accompanied by a list of 146 references to the literature.

Report on cooperative quail investigation, 1925-1926, with preliminary recommendations for the development of quail preserves, H. L. STODDARD ([Beachton, Ga.]: Com. Coop. Quail Invest., 1926, pp. 62, pls. 5).—This is a report of progress in investigations conducted by an agent of the U. S. D. A. Bureau of Biological Survey in southern Georgia and northern Florida from October 1, 1924, to May 30, 1926, in continuation of that previously noted (E. S. R., 53, p. 252). Following a discussion of the general progress of the investigation, the food habits of quail are dealt with by C. O. Handley (pp. 10-20). Next follow accounts of the results of trapping and banding experiments (pp. 21-31), natural enemies, parasites, and diseases (pp. 32-47), and the development of quail preserves (pp. 48-62).

A year's program for bird protection in Pennsylvania, G. M. SUTTON (*Penn. Bd. Game Commrs. Bul.* 9 [1927], figs. 36).—This consists of a number of practical accounts of birds and their protection.

Observations on the habits and the injury caused by the bites or stings of some common North American arthropods, H. E. EWING (*Amer. Jour. Trop. Med.*, 8 (1928), No. 1, pp. 39-62, figs. 4).—The author reports upon experiments performed over a period of four years on some of the most common biting or stinging arthropods, including the common striped scorpion, *Centruroides vittatus* (Say); the giant whip scorpion, *Mastigoproctus giganteus* (Lucas); the common tarantula of the Southwest, *Eurypelma californica* Ausserer; the common eastern trap-door spider, *Pachylomerus audouinii* (Lucas); *Lycosa carolinensis* Walckenaer; *L. punctulata* Hentz; an undetermined species of *Lycosa*; the black widow, *Latrodectus mactans* Fab.; the house centipede, *Scutigera forceps* (Raf.); the giant water bug, *Belostomatidae* (Say); *Nabis rosipennis* Reut.; and bees.

The life cycle and mating habits of the male tarantula, W. J. BAERG (*Quart. Rev. Biol.*, 3 (1928), No. 1, pp. 109-116, figs. 3).—This is a report of studies of *Eurypelma californica*, a tarantula common in a number of the

Southwestern States. In observations extending over a period of 9 years, the author has found the life cycle from hatching until sexual maturity to be about 11 years, with the possible variation of one year more or one year less, during which time there are some 22 molts.

The signification of the autohemorrhage of insects [trans. title], A. C. HOLLANDE (*Arch. Anat. Micros.*, 22 (1926), No. 3, pp. 374-412, figs. 16).—This is a discussion of the defensive secretion or reflex bleeding that occurs in the Lepidoptera, Orthoptera, and Coleoptera, and the relation of autohemorrhage and the protrusile glandular organs. A list is given of 50 references to the literature.

Migration as a factor in pest-outbreaks, T. B. FLETCHER (*Bul. Ent. Research*, 16 (1925), No. 2, pp. 177-181).—This is a general discussion of the relation of migration to losses from insect attack, particularly as applied to India.

[Report of New York State Station division of entomology] (*New York State Sta. Rpt. 1927*, pp. 43-50).—This consists of a brief report of studies of apple, pear, cherry, and peach insects, and, on Long Island, the control of the striped cucumber beetle, dusting experiments with potatoes, and control of aphids and thrips in cauliflower seed beds.

The work with apple aphids was conducted particularly with a view to determining the insecticidal efficiency of various types of oil sprays at different dilutions against the eggs and newly hatched nymphs of the rosy apple aphid. The results obtained indicate that the newly hatched nymphs are more susceptible to 2 per cent lubricating oil emulsions than are the eggs. The emulsions proved compatible with nicotine sulfate and superfine tobacco dust, and the addition of either of these materials to sprays containing 2 per cent oil rendered the preparations more toxic against the nymphs. When the treatment was delayed until the tips of the leaves showed, the combinations of oil sprays of a low oil content with nicotine sulfate or tobacco dust appeared to be safer than oil sprays alone that contained sufficient oil to control the nymphs. Preparations of oil emulsions to which were added either sodium sulfide or clear copper sulfate solution caused marked damage to unfolding leaf and blossom buds. Lubricating oil emulsions containing 2 per cent oil did not prove to be dependable ovicides. Preparations containing 4 per cent oil or more displayed a high degree of toxicity. The present spray program, which depends to a large extent on lime sulfur, lead arsenate, and nicotine sulfate, is meeting more nearly the needs of the apple industry than some of the systems of treatment which provide for the extensive use of oil sprays.

Investigations of the life history and habits of the fruit tree leaf roller were brought to a close. In comparative tests of white oil emulsions and lead arsenate against the codling moth, the oils proved to be toxic to the eggs for approximately one week after being applied, but thereafter they displayed marked diminution in ovicidal properties.

In combating the pear psylla it was found that careful and timely application of 3 per cent lubricating oil emulsion reduces the number of hibernating psyllas on the trees at the time of application. The oil residue on the bark apparently exerts a noticeably repellent action against the flies that have escaped the spraying or which have migrated from neighboring plantings. The eggs are more resistant to the treatment than either the adults or the nymphs, and it appears to be conclusively demonstrated also that the oil residue on the bark, as a result of spraying against either the hibernating flies or eggs, is toxic to the newly hatched nymphs.

Reporting upon cherry fruit flies, it is stated that the spray methods as outlined in Circular 87 (E. S. R., 56, p. 259) appear on the whole to be giving

satisfactory control and that they have been adopted in the leading cherry districts. It is pointed out that a study of the habits of these flies makes it clear that in orchards in the same general area there may exist noticeable differences in the time of emergence of the adults from the ground, due apparently to variations in exposure, soil, and perhaps other factors.

The work with peach insects consisted principally of a study of the life history and habits of the peach cottony scale (*Pulvinaria amygdali* ?), as noted (E. S. R., 57, p. 760), and the European fruit lecanium (*Lecanium corni*). These were found to be equally susceptible to the two types of oil sprays, namely, lubricating oil emulsion for dormant treatments and white oil emulsion for summer or foliage treatments.

In the work with the striped cucumber beetle, arsenical dust mixtures containing hydrated lime as the diluent gave similar results. Sodium fluosilicate-hydrated lime dust mixtures were inferior to arsenical dust mixtures, chiefly due to the injurious effect of such dusts on foliage and growth. A nicotine-hydrated lime dust mixture of 2 per cent strength gave results that were comparable to those of the arsenical mixtures. Arsenical spray mixtures were not so effective in affording protection to plant growth as dust mixtures, with the exception of a spray composed of calcium arsenate 4 lbs., fish oil 1 qt., and water 50 gal.

A high percentage of mortality was obtained by the application at the time of dusting the main cucumber crop of high strength nicotine dusts by box fumigators on squash seedlings used as trap crops.

A brief account is given of spraying and dusting experiments with potatoes, a continuation of which has been noted from another source (E. S. R., 58, p. 756).

The report concludes with a brief account of experimental work with tobacco cloth and cheesecloth in protecting cauliflower seed beds on Long Island from aphid and thrips infestation during July. The grades of cloth used appeared to control aphid and thrips infestations within the beds, but plants grown under these conditions were tender and on being transplanted in the field after a period of 4 to 7 days' exposure did not develop as rapidly as seedlings grown under normal conditions. In a comparative study of the dosage of tobacco dusts to produce effective results, it was found that by the addition of hydrated lime and water to pure tobacco dust, in proportions of equal parts by weight of tobacco dust and lime plus 7 per cent of water, a considerable reduction was permissible without losing the aphiscidal properties of the dust.

An annotated list of the species of injurious insects and their parasites recorded in Italy up to the close of 1911, Part II, fasc. 3 [trans. title], G. LEONARDI (*Ann. R. Ist. Super. Agr. Portici, S. ser., 1* (1926), pp. 148-295).—This is a continuation of the list previously noted (E. S. R., 55, p. 759), and deals with the Coleoptera.

[Economic insects in Queensland] *Queensland Dept. Agr. and Stock, Ent. Leaflets 1* [1926?], pp. 3, figs. 2; 2, pp. 4, pl. 1; 3, pp. 3, pl. 1; 4, pp. 4, pl. 1; 5, pp. 4, pl. 1; 6 (1927), pp. 4, pls. 2; 7 [1927], pp. 4, pls. 2; 8 (1927), pp. 4, pl. 1; 10 (1927), pp. 3, pls. 2).—These papers deal with insects of importance in Queensland, as follows: (1) Some Hints regarding Entomological Inquiries, by R. Veitch; (2) The Queensland Fruit Fly (*Chaetodacus tryoni* Froggatt), (3) The Woolly Aphis Parasite (*Aphelinus mali* Hald.), and (4) The Codling Moth (*Cydia pomonella* Linnaeus), all by H. Jarvis; (5) The Banana Weevil Borer (*Cosmopolites sordida* Chev.), by J. L. Froggatt; (6) Insects and Their Relatives, by R. Veitch; (7) The Banana Thrips (*Anaphothrips signipennis* Bagnall), by J. L. Froggatt; (8) The San José Scale (*Aspidiotus perniciosus*

Comstock), by H. Jarvis; and (10) The Corn Ear Worm on Tomatoes, by R. Veitch.

Report of the Government entomologist for the year 1926 (*Wellcome Trop. Research Labs., Ent. Sect. Bul. 24* (1927), pp. 6, pl. 1).—This is a discussion of the more important insects of the year in the Sudan and control work.

List of publications on Indian entomology, 1926 (*Agr. Research Inst., Pusa, Bul. 168* (1927), pp. 48).—This list is in continuation of that of the previous year (*E. S. R.*, 57, p. 258).

[Insect pests in the Philippines] (*Philippine Bur. Agr. Ann. Rpt.*, 26 (1926), pp. 57–59, 61, 62, 64, pl. 1).—Brief notes are given on some of the more important insect enemies of agricultural crops.

Insects injurious to the rice crop, J. W. INGRAM (*U. S. Dept. Agr., Farmers' Bul. 1543* (1927), pp. 11–17, figs. 15).—This supersedes Farmers' Bulletin 1086, previously noted (*E. S. R.*, 43, p. 252).

Contributions from the Wisley Laboratory.—L, Some pests of water lilies, G. F. WILSON (*Jour. Roy. Hort. Soc.*, 53 (1928), No. 1, pp. 81–91, pls. 4, fig. 1).—This is a brief summary of information on insect and other animal pests of species of Nymphaeas, particularly in England.

Insect pests of the household, T. L. GUYTON (*Penn. Dept. Agr. Bul. 432* (1926), pp. 21, figs. 9).—A practical account.

Biological methods of combating insect pests [trans. title], F. LAHILLE (*Rev. Facult. Agron. y Vet. Buenos Aires*, 6 (1927), No. 1, pp. 50–72, fig. 1).—This is a discussion of the means of combating insects pests by their natural enemies.

Studies on elemental sulfur as a soil insecticide, J. W. BULGER (*Ohio Jour. Sci.*, 28 (1928), No. 1, pp. 1–59, pls. 3, fig. 1).—The studies here reported have led to the conclusion that since direct treatments of sulfur did not have any insecticidal effect upon ants or white grubs, since all of the forms of insects used tolerated a very high degree of acidity, and since in field tests sulfur showed no indications of insecticidal control, elemental sulfur can not, in the light of the present knowledge, be considered to promise any value as a soil insecticide.

Experimental spraying of high coconut trees against caterpillars [trans. title], S. LEEFMANS (*Landbouwk. [Buitenzorg]*, 3 (1927), No. 5, pp. 260–270, figs. 3; *Eng. abs.*, p. 270).—This is an account of the application of arsenate of lead to coconut trees by a pump which was hoisted in the trees by means of a tackle after the operator had climbed the tree. It was found that a tree could be treated by three men in 15 minutes. This method is not adapted to native plantations because of the expense and danger from poisoning man, cattle, and poultry.

A new grasshopper injurious to rice in Siam, B. P. UVAROV (*Bul. Ent. Research*, 16 (1925), No. 2, pp. 159–161, figs. 5).—Under the name *Quilta oryzae* n. sp. the author describes a grasshopper which is reported to damage rice.

On the knowledge of the anatomy and life history of the phasmid *Carausius morosus* Br., H. LEUZINGER, R. WIESMANN, and F. E. LEHMANN (*Zur Kenntnis der Anatomie und Entwicklungsgeschichte der Stabheuschrecke Carausius morosus* Br. Jena: Gustav Fischer, 1926, pp. XI+414, pls. 2, figs. 178).—An extended discussion of the development of this phasmid.

Sheep and goat lice and methods of control and eradication, M. IJES (*U. S. Dept. Agr. Leaflet 13* (1923), pp. 8, figs. 3).—This is a brief practical account.

The phlox plant bug, E. N. COBY and P. A. MCCONNELL (*Maryland Sta. Bul. 232* (1927), pp. 15–22, figs. 11).—A practical summary of information on *Lopidea*

davisii, which first appeared in Maryland in 1916. Notes are given on its life history and habits and descriptions of its several stages. Its life cycle is completed in from 46 to 55 days. Control consists of a clean-up in the spring through destruction by burning of dead stems upon which the eggs might have passed the winter. Applications during the growing season of Black Leaf 40 or liquid toilet soap, preferably the latter, in the form of a forceful mist spray at the rate of 1 lb. to 4 gal. of water, are recommended.

Poeciloscytus cognatus Fieb. (Hemiptera, Miridae) as a serious pest of sugar-beets, N. S. DEKHTIAREV (*Bul. Ent. Research*, 18 (1927), No. 1, pp. 1-3, figs. 2).—This bug was the source of great losses to the sugar beet industry in the districts of Poltava and Kharkof, Ukraine, in the summer of 1926. The application of kerosene emulsion or a soft soap solution killed the nymphs. Good results were also obtained by the application of sulfur dust.

The citrus psylla (*Diaphorina citri* Kuw.) (Psyllidae: Homoptera), M. A. HUSAIN and D. NATH (*India Dept. Agr. Mem., Ent. Ser.*, 10 (1927), No. 2, pp. [2]+5-27, pls. 4, figs. 3).—A report of studies of an important enemy of citrus in India, which is present throughout the country and in certain parts of the Punjab has been responsible for very serious losses. The details of its structure, life history, bionomics, and control are presented. This psylla attacks and kills young tender shoots, with the result that in two or three seasons the tree is completely defoliated and begins to dry up. During severe attacks the fruit does not set or drops off, and what is left is dry and insipid.

Several predators and parasites help to keep it in check, of which *Tetrastichus radiatus* is of particular importance. Spraying is an effective method of control, rosin compound and tobacco decoction having given good results.

A comparative study of the structural characters used in the classification of the genus *Macrosiphum* of the family Aphididae, with special reference to the species found in California, L. B. SOLIMAN (*Calif. Univ. Pubs. Ent.*, 4 (1927), No. 6, pp. 89-158, figs. 77).—This work includes a discussion of the synonymy and history of the genus *Macrosiphum* Pass. and allied genera, with a key to those of the subtribe Macrosiphina, characters of the genus *Macrosiphum*, California species of the genus, California species recently removed from the genus *Macrosiphum* to other genera, and lost species.

The giant mealy bug and its control, G. R. DUTT (*Bul. Ent. Research*, 16 (1925), No. 2, pp. 155-158, pls. 3).—This is an account of *Monophlebicus stebbingi octocaudatus* Gr., which occurs in Pusa on many fruit trees and particularly on the peach, plum, mango, and jack.

The fumigation of citrus trees in Palestine, G. E. BODKIN (*Bul. Ent. Research*, 16 (1925), No. 2, pp. 143-149, pls. 4).—An introductory discussion of citrus cultivation in Palestine is followed by a brief account of the eight scale insects attacking citrus in Palestine and a discussion of the fumigation methods and the results that have been obtained. Three scales are of economic importance, namely, the California red scale, Florida red scale, and purple scale. The Florida red scale is of by far the greatest importance, and against it fumigation work with hydrocyanic acid gas has been conducted. This scale is thought to have been first introduced into Palestine from Syria some 15 years ago, since which time it has spread throughout the northern districts of Palestine, which adjoin Syrian territory.

Experimental investigations of the action of the poisonous hairs of hibernating brown-tail moth caterpillars on the human skin [trans. title], E. N. PAWLOWSKY and A. K. STEIN (*Ztschr. Wiss. Biol., Abt., A, Ztschr. Morph. u. Ökol. Tiere*, 9 (1927), No. 5, pp. 615-637, figs. 15).—This is a report of studies presented in connection with references to the literature, a list of 25 of which is included.

A contribution to the embryology of *Pieris rapae*, L. EASTHAM (*Quart. Jour. Micros. Sci. [London], n. ser., 71 (1927), No. 283, pp. 353-394, pls. 3, figs. 4*).—This is an extended account of studies on the embryology of the imported cabbage worm, which includes a list of 36 references to the literature.

Sugar-cane moth borers (*Diatraea* spp.) in British Guiana, H. E. BOX (*Bul. Ent. Research, 16 (1926), No. 3, pp. 249-266*).—This discussion is based upon observations made in British Guiana from September, 1922, until January, 1925, while the author was engaged as entomologist for a sugar cane-growing concern.

Three species of *Diatraea*, namely, *D. saccharalis* Fab., *D. canella* Hamp., and *D. lineolata* Dyar, attack sugar cane in British Guiana, the first two being of economic importance. Notes are given on the life history of the borers, the damage caused, natural enemies, and control measures.

A list of 21 references to the literature is included.

Life history of the codling moth in Delaware, E. R. SELKREGG and E. H. SIEGLER (*U. S. Dept. Agr., Tech. Bul. 42 (1928), pp. 61, figs. 35*).—This is a report of life history studies commenced in 1919 in cooperation with the Delaware Experiment Station. The studies are reported under the headings of seasonal history studies of 1919, codling moth band studies of 1919, seasonal history studies of 1920, codling moth band studies of 1920, review of seasonal history studies of the codling moth in 1919 and 1920, natural enemies of the codling moth, diseases of the codling moth, and miscellaneous studies. The details are presented in large part in tabular and chart form.

The codling moth (*Cydia pomonella*), I, II, S. L. ALLMAN (*Agr. Gaz. N. S. Wales, 38 (1927), Nos. 7, pp. 551-556; 8, pp. 624-631, figs. 4*).—In part 1 experiments are reported which demonstrate that an increased efficiency is obtained by doubling the amount of lead arsenate previously employed. In part 2 some aspects of the life history of the moth at Bathurst Experiment Farm, New South Wales, during the season 1926-27 are dealt with. Data relating to the pupation of the spring brood, emergence of the spring brood of moths, oviposition by moths of the spring brood in breeding jars, length of life of male and female moths of the spring brood, time of deposition of eggs, hatching of larvae, length of the feeding period, and length of cocooning period of transforming larvae at Bathurst are reported in tabular and chart form.

Further investigations into codlin moth control.—Second report on experiments carried out at Blackwood Experiment Orchard, R. FOWLER (*Jour. Dept. Agr. So. Aust., 31 (1927), No. 5, pp. 480-492*).—A discussion of the results of experiments conducted at the Blackwood Experiment Orchard with various trap baits and with sprays. It was found that large numbers of moths can be caught in suitable traps properly baited, and that it is profitable to put out a number from the last week in October until the end of November, and again from the end of January to the middle of February, which cover the periods of maximum emergence and give the best results. The author recommends the use of traps for the moths, bandaging to catch the larvae, four or five spray applications, and orchard sanitation. The spray recommended consists of 4 lbs. of arsenate of lead powder to 100 gal. of water, with a spreader such as calcium caseinate.

The oriental peach moth in Ontario, W. A. ROSS (*Canada Dept. Agr., Ent. Branch Circ. 57 (1927), pp. 4, figs. 3*).—A brief account is given of the nature of injury, life history, and economic status of, and control measures for, the oriental peach moth, first observed in Ontario in the fall of 1925. From the center of infestation in a large orchard near St. Davids it has spread to Stamford on the south, the Niagara River on the east, and the lake shore on the north,

there being but little spread to the west. Isolated infestations are also said to occur in the vicinity of St. Catharines, at Peachland, Vineland Station, Grimsby, Bartonville, Fonthill, and Olinda and Albuna, in Essex County.

The food of culicine larvae: Food organisms in pure culture, M. A. BARBER (Pub. Health Rpts. [U. S.], 43 (1928), No. 1, pp. 11-17).—The eggs of *Culex quinquefasciatus* and of the yellow-fever mosquito were found to hatch readily in sterile nutrient media. Healthy adults of one or both of these species were obtained in pure cultures of yeast, of infusoria, of algae, and of bacteria, and in various combinations of these microorganisms. Adults of *C. territans* were also obtained in cultures of mixed bacteria, and of *Aedes sollicitans* in infusoria plus bacteria and in algae plus bacteria. A combination of bacteria with infusoria or with algae seemed to afford the best conditions for growth. No considerable growth of larvae was obtained in sterile nutrient media or in cultures provided only with dead organic material.

Physical factors in mosquito ecology, R. SENIOR-WHITE (Bul. Ent. Research, 16 (1926), No. 3, pp. 187-248, pls. 4, figs. 3).—"Natural waters in Ceylon extend in pH range from 5.4 to 9.2, but mosquito larvae in general are only found between pH 5.8 and 8.6. Species living in moving water have wider tolerances than those of standing water, and the former extend further into acidity, and the latter into alkalinity, respectively. Anophelines have wider tolerances than culicines. The measurement of 'residual' pH, i. e., the value after bringing the water into gas-equilibrium with the air, is shown to be of value. Natural-water breeders are thus found to be intolerant of any acidity not caused by CO₂.

"The natural-water breeders are all found in water with C×10³ of <1,000. The artificial-water breeders extend their range into much higher concentration. There is the possibility of the existence of biological races of natural-water breeders in brackish water, but in inland waters the moving-water species have their optimum at <300, and the standing-water species at <500. The former, again, have wider tolerance limits. Conductivity has been measured at 25° C.

"There appears to be no sharply limiting factor in dissolved oxygen, but waters in which this is low are not favored by anophelines. In rice fields the presence of *Anopheles listoni*, the only malaria carrier commonly breeding in them, is shown to be dependent on a considerable amount of dissolved oxygen, and methods for avoiding this are discussed. Saline ammonia in amounts of less than 1 part per million is inhibitory to natural-water breeders, especially anophelines. . . . There is shown to be a feeding association of certain mosquitoes mainly anophelines, with certain algae, on the presence of which that of the mosquitoes probably depends.

"The pH of the various parts of the gut in larvae is tabulated. There is shown to be very little difference between various species. In all, the midgut is very alkaline, the other parts less so. Diseased states seem to be related with decreased alkalinity."

The tadpole of the spadefoot toad an enemy of mosquito larvae, M. A. BARBER and C. H. KING (Pub. Health Rpts. [U. S.], 42 (1927), No. 52, pp. 3189-3193, figs. 2).—This is an account of observations of and experiments with tadpoles of *Scaphiopus hammondi* in New Mexico, which unlike those of most toads feed on mosquito pupae and larvae. This toad is known to occur in the Western and Southwestern States from Montana south to Texas and Mexico, and westward to the Pacific Coast States and northern Lower California. While it is an active and efficient enemy of mosquito larvae, it is said to be limited to shallow temporary pools.

Larval control by means of *Gambusia* in the Province of Cagliari, with remarks on the biology of this fish [trans. title], G. PETRAGNANI and A.

CASSELLI (*Riv. Malariol.*, 6 (1927), No. 4-5, pp. 709-727; *Eng. abn.*, pp. 878, 879).—This is an account of mosquito control in Sardinia by *G. holbrookii*, which has become acclimatized and lives in fresh as well as in salt water.

Some Tachinidae (Dipt.) of economic importance from the Federated Malay States, M. BEZZI (*Bul. Ent. Research*, 16 (1925), No. 2, pp. 115-123).—Sixteen species of Tachinidae are here considered, of which four are described as new.

The seasonal frequency of calliphorine blowflies in Great Britain, R. A. WARDLE (*Jour. Hyg. [London]*, 26 (1927), No. 4, pp. 441-464, figs. 4).—The author finds that the disparity between the numerical abundance of *Calliphora erythrocephala* and *C. vomitoria* in Great Britain is not such as to suggest that the latter species is rare or uncommon except in spring and autumn. During the summer the number of both species are approximately equal. *C. vomitoria* shows a more rapid rate of increase during early summer than does *C. erythrocephala*. This seems to be correlated with a lower number of dwarf forms and a consequently lower prematuration mortality of imagoes. The greater response, on the whole, of both species to trap baits under sheltered conditions than under open conditions is due not to phototropism but to a susceptibility to lessened attraction of baits. This lessened attraction is brought about by the superficial desiccation induced by weather conditions. Such desiccation is less rapid under sheltered conditions than under open conditions. This susceptibility is more marked among males than among females, and among *C. vomitoria* individuals than among *C. erythrocephala* individuals, owing to lesser powers of olfactory perception.

A list of references to the literature is included.

Insecticide test for potato beetles (*Minnesota Sta., Crookston Substa. Rpt.* 1926, pp. 39-41).—A brief report is given of the results of a comparison of three brands of London purple plus hydrated lime and calcium arsenate for the control of the Colorado potato beetle, applied as sprays at the rate of 2 lbs. to 50 gal. of water. Plats sprayed with two brands of London purple were apparently as vigorous as those sprayed with calcium arsenate, but the third showed the most dead foliage at the time of frost. It is concluded that calcium arsenate made up the best spray mixture and is to be preferred if the price be the same.

In a comparison of wet and dry calcium arsenate, the dry form was apparently not as effective as the liquid spray. No appreciable difference was noted between the Bordeaux dust and the liquid Bordeaux. Leafhoppers were slightly better controlled with the nicotine lime than with poison alone. The Bordeaux, however, in three applications effectively checked the leafhoppers and flea beetles.

The western cedar pole borer or powder worm, H. E. BURKE (*U. S. Dept. Agr., Tech. Bul.* 48 (1928), pp. 16, figs. 9).—This is an account of *Traohykele blondeli* Mars., which severely injures the wood of many standing trees of western red cedar in Oregon, Washington, and British Columbia by boring flattened, oval holes, which render the timber unfit for higher grade uses. The beetle lays its eggs on the wood of scars on the trunk or branches of standing trees, and the borers hatching from the eggs mine up and down through the wood of the trunk until they become full grown, which apparently takes at least 3 years. Transforming into beetles they remain in the wood for about 6 months, and then emerge to start a new generation.

Under present conditions of forest management the only method of controlling loss which appears practical is to use the injured material for purposes for which it is best suited. The worm holes apparently do not seriously

injure cedar timber for use as fencing, sills, posts, poles, or other construction purposes. They do, however, make it worthless for shingles, cooperage, ship-building, and other special purposes where tight or unblemished material is required.

A list of 38 references to the literature is included.

Provisional notes on the Javanese beetle (*Cryptorrhynchus gravis* F.) [trans. title], S. LEEFMANS (*Landbouw [Buitenzorg]*, 3 (1927), No. 5, pp. 306-309; *Eng. abs.*, pp. 308, 309).—This is an account of a beetle enemy of the mango which, it is thought, reaches the young fruits only by flight.

Description of a new chalcid ectoparasite of scolytid beetles [trans. title], G. Russo (*Ann. R. Ist. Super. Agr. Portici*, 3, ser., 1 (1926), pp. 75-86; *abs. in Rev. Appl. Ent.*, 15 (1927), Ser. A, No. 4, p. 202).—Under the name *Eurytoma masii* the author describes a new parasite of scolytids, including *Chaetoptelius vestitus* (Muls. and Rey.) in pistachio, *Eccoptogaster amygdali* Guér. in almond, and *Hylesinus oleiperda* F. and *Phloeotribus scarabaeoides* Bern. in olive, all in Sicily; and also *H. fraxini* Panz. in olive and *E. rugulosus* (Ratz.) of apricot and plum in Portici. This parasite is very active, and together with *Cheilropachys colon* (L.) and *Cerocephala cornigera* Westw. has destroyed as high as 50 per cent of the larvae and pupae of these scolytids.

[Control of the coffee berry beetle] (*Anz. Schädlingssk.*, 3 (1927), No. 6, pp. 69-74; *abs. in Rev. Appl. Ent.*, 15 (1927), Ser. A, No. 9, p. 454).—This consists of a letter written by A. Neiva, chief of the Coffee Defense Service in Sao Paulo, Brazil, giving an account of a successful campaign conducted against *Stephanoderes hampei* Ferr., to K. Friedrichs, and the latter's reply in which a comparison is made of the situation in Brazil with that in the Dutch East Indies. Through Government control in the State of Sao Paulo it has been possible to bring about the complete picking of the berries on the bush and on the ground and to burn the debris or bury it 12 in. deep. This was followed by fumigation with carbon disulfide of the harvested berries, which were then washed and dried in the sun as usual.

A new practical method of using hydrocyanic acid gas against *Anthonomus pomorum* L. [trans. title], STELLWAAG and GEISSLER (*Anz. Schädlingssk.*, 3 (1927), No. 6, pp. 63-67; *abs. in Rev. Appl. Ent.*, 15 (1927), Ser. A, No. 9, p. 453).—The authors have found it practical to destroy the apple blossom weevil (*A. pomorum*), which hibernates almost exclusively in the bark of old apple trees, by the application of hydrocyanic acid gas during the dormant period. The application of a solution of sodium cyanide as a spray, followed shortly afterwards by an application of a solution of hydrochloric acid, caused instantaneous generation of hydrocyanic acid gas. A 20 per cent solution of sodium cyanide is preferred, and for neutralization 2 cc. of crude 32 per cent hydrochloric acid solution to every gram of solid sodium cyanide is necessary.

Observations on the ichneumon-fly *Epiurus pterophori* Ashmead, M. C. WILDER (*Psyche*, 34 (1927), No. 6, pp. 227-229, fig. 1).—The observations here reported relate to a large parasite found in the chambers of the moth *Lophoptilus eloisella* in the pith cavity of the stalks of the evening primrose. It is also recorded as parasitic on the larvae of stem-boring and stem-gall-making Lepidoptera and Coleoptera.

On the biology of the parasites of *Lophyrus* [trans. title], L. SIROWSKI (*Rocz. Nauk Rolnicz. i Leśnych*, 14 (1925), No. 1, pp. 1-25, pls. 3, figs. 4; *Ger. abs.*, pp. 22-25).—This is an account of studies of the parasites of the sawfly *L. sertifer*, Geoffr., an important pest of pine forests in the Province of Posen.

Notes on Porto Rican scale parasites, H. L. DOZIER (*Jour. Dept. Agr. Porto Rico*, 10 (1926), No. 3-4, pp. 267-277, figs. 11).—Ten species parasitic on Coccidae

in Porto Rico are dealt with, two of which, namely, *Achrysophophagus seini* and *A. gahani*, reared from citrus mealybug infesting croton at Rio Piedras, are described as new.

Experiments for the control of the European red mite and other fruit-tree mites, E. J. NEWCOMER and M. A. YOTHERS (*U. S. Dept. Agr., Tech. Bul. 25 (1927), pp. 34, figs. 5*).—Following a brief introduction, the authors report upon work with dormant sprays, summer sprays, spray injury, and the composition of spray materials. The work, the details of which are presented in large part in tabular form, has shown that lime sulfur is of little value in the control of the winter eggs of the European red mite (*Paratetranychus pilosus* C. & F.) and the clover mite. Lubricating-oil emulsions and miscible oils at dilutions of 2, 3, and 4 per cent of oil prevented more than 95 per cent of the eggs from hatching in most cases. Orchard tests indicated that a spray containing 3 per cent of oil was more efficacious than a 2 per cent spray. Infestations of mites were noticeably less on oil-sprayed trees than on those sprayed with lime sulfur.

"Summer sprays or dusts of sulfur gave very unsatisfactory control of the European red mite, but sulfur dust controlled the two-spotted mite (*Tetranychus bimaculatus* Harvey) very well in a single test. Summer-strength lime sulfur killed most of the mites but very few eggs. When applied at the time of the pink and calyx sprays very good control resulted, since practically no eggs are present on the trees at that time. The effect of later applications was not nearly so lasting as that of oil sprays. Lubricating-oil sprays, made from brown neutral, red engine, or crystal oils and used at dilutions containing 0.5 or 0.67 per cent of oil, have given very good results against the mites. These sprays have killed practically 100 per cent of the mites and most of the summer eggs. They are thus superior to lime sulfur. Of the miscellaneous sprays tested, the only one that was of any promise was the potash fish-oil soap. Used at the rate of 2 lbs. to 50 gal., this killed 90 to 99 per cent of the mites, but not very many eggs. It would perhaps be of use in spraying tender foliage that would be injured by oil sprays. Nicotine sulfate killed less than 50 per cent of the mites, for the most part, except when used in combination with the potash fish-oil soap, when the control was excellent.

"No injury of any consequence resulted from the use of dormant lime sulfur or from dormant oil sprays, if used before the fruit buds separated. Sulfur sprays or dusts used on the foliage did no particular harm. Summer-strength lime sulfur burned the leaves slightly and sometimes burned fruits exposed to the sun. Lubricating-oil sprays, used at strengths of 0.5 or 0.67 per cent of oil on the trees in foliage, caused no injury of any consequence to apple, pear, prune, or cherry, if the oils were thoroughly emulsified. Peach foliage was invariably spotted by oil sprays. Free oil spotted the fruit and foliage of any variety. Emulsions made of the crystal oil appeared to be safer to use than those made of brown neutral or red engine oils."

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of annual meeting, November 25-27, 1927 (*Amer. Soc. Anim. Prod. Proc. 1927, pp. 240, figs. 10*).—The report of the annual meeting held at Chicago, November 25-27, 1927 (*E. S. R.*, 57, p. 761).

Among the papers presented were the following: The Relation of Phosphorus Deficiency to the Utilization of Feed, by C. H. Eckles and T. W. Gullickson (pp. 16-21); The Comparative Nutritive Value of the Proteins of Linseed Meal and Cottonseed Meal for Different Animals, by R. M. Bethke, G. Bohstedt,

H. L. Sassaman, D. C. Kennard, and B. H. Edgington (pp. 21-25); **Energy Metabolism as Related to the Plane of Nutrition in Cattle**, by E. B. Forbes (pp. 26-28); **Utilization of Grain in Silage**, by R. B. Becker and W. D. Gallup (pp. 28-32) (E. S. R., 58, p. 269); **Calcium Requirements of Breeding Swine**, by A. G. Hogan, L. E. Casida, and F. F. McKenzie (pp. 82-84); **Feeding Pumpkins and Squashes to Hogs**, by J. Sotola (pp. 107-109) (E. S. R., 56, p. 566); **Immunization against Hog Cholera as a Management Practice in the Growing of Hogs**, by S. S. Buckley (pp. 110-113); **A Method of Determining Quality in the Wool and Meat of Market Lambs**, by D. A. Spencer (pp. 163-167); **A Statistical Interpretation of Some Texas Lamb Feeding Data**, by J. M. Jones and J. L. Lush (pp. 167-170); and **Some Tendencies in Foreign and Domestic Sheep Production**, by R. C. Miller (pp. 179-184). The other papers presented have been previously noted (E. S. R., 58, p. 398).

A mechanical device for increasing the accuracy in the feeding of hay to experimental animals, R. G. CONNELLY and G. C. WHITE (*Jour. Dairy Sci.*, 10 (1927), No. 6, pp. 513-518, figs. 4).—A description of an experimental hay bag designed by the authors to increase the accuracy in feeding hay to experimental animals. Detailed directions for the construction and placing of the bag are also given.

Further observations in eliminating the toxicity of cottonseed meal, W. D. GALLUP (*Jour. Dairy Sci.*, 10 (1927), No. 6, pp. 519-526).—Continuing this study (E. S. R., 56, p. 762) on the elimination of the toxicity of cottonseed meal, albino rats were fed rations containing from 35 to 45 per cent cottonseed meal. Three forms of meal of known gossypol and *d*-gossypol content, fed as raw, ether extracted, and autoclaved, were incorporated in the rations. Growth and reproduction records of the animals were obtained over a period of five to six months.

The raw meals, which probably contained some free gossypol, had a pronounced toxic effect as evidenced by the slow growth and poor reproduction of the animals. Ether extraction, which removes some of the gossypol in a proved toxic form, did not prevent the injurious effects that occurred with the raw meal. Autoclaving the moist meal reduces the toxicity, but does not entirely destroy the insoluble gossypol. When properly supplemented, the autoclaved meal produced good growth and reproduction.

Determining the starch equivalent of sifted oat flour [trans. title], F. A. BAZILEVSKAYA (*Āroslavsk. Zootekh. Opytn. Sta. Raboty* 1926, pp. 104-107).—Sifted oat flour, a product consisting of 41 per cent of the total flour after passing through a 2.5 mm. sieve, was found to have a starch equivalent of 70.787 in digestion trials with calves at the Yaroslavl Zootechnical Experiment Station.

Commercial feeding stuffs, September 1, 1926, to August 31, 1927, B. YOUNGBLOOD, F. D. FULLER, and S. D. PEARCE (*Texas Sta. Bul.* 370 (1927), pp. 132).—This is the twenty-second report of the chemical analyses and microscopical examination of feeding stuff samples inspected in the State during the year ended August 31, 1927 (E. S. R., 57, p. 66).

Fattening baby beef for market, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt.* 1926, pp. 53-55).—Four lots of 8 calves each, 4 heifers and 4 steers per lot, were fed for 210 days. The grain rations fed were lot 1 equal parts of ground barley and ground wheat screenings, lot 2 equal parts of ground barley and ground oats, and lots 3 and 4 ground barley. All lots received 2 lbs. of linseed meal per head daily except lot 4 which received no supplement. Corn silage and alfalfa hay formed the roughage portion of the ration, and free access to water and salt was allowed in all lots. The calves averaged approximately 480 lbs. at the beginning of the experiment.

The average daily gains per head in the respective lots were 1.88, 1.97, 1.98, and 1.68 lbs. at a feed cost per 100 lbs. of gain of \$9.97, \$10.56, \$10.66, and \$9.12, including the cost of grinding. The selling price per hundredweight was the same in all lots.

It was found that oats could successfully replace one-half the barley in the grain ration without affecting the rate or economy of gain materially. Replacing one-half the barley with wheat screenings reduced the rate of gain and also the feed cost. Omitting linseed meal from the ration reduced the gains and the cost of feed, and in this experiment returned a greater margin per calf over feed cost than any of the other rations.

Fattening beef calves for market, A. A. DOWELL (Minnesota Sta., Crookston Substa. Rpt. 1927, pp. 50-52).—Four lots of 8 calves each, averaging approximately 374 lbs. at the beginning of the experiment, were fed for 217 days. Lots 1, 3, and 4 received ground barley and lot 2 ground corn as the grain portion of the ration. In lots 1 and 2 the protein supplement consisted of 1.5 lbs. per head daily of linseed meal, in lot 3, 2.25 lbs. per head daily of gluten feed, and in lot 4 no supplement. Corn silage and alfalfa hay formed the roughage portion of all rations, and all lots had free access to salt and water.

The average daily gains in the respective lots were 2.21, 2.34, 2.08, and 1.91 lbs. per head. The feed cost per 100 lbs. of gain was \$9.45, \$10.29, \$10.72, and \$9.23 in the respective lots.

Ground barley was practically as efficient as ground corn in the amount of feed required to produce 100 lbs. of gain, and due to its lower cost the calves fed barley returned the greatest margin over feed cost. Calves fed ground corn were fatter at the end of the trial and sold for 25 cts. more per hundredweight than the barley-fed calves. Linseed meal proved more efficient than gluten feed in rate and economy of gain. Adding linseed meal to a ration of ground barley, corn silage, and alfalfa hay increased the rate of gain 0.3 lb. per head daily, increased the feed cost slightly, and also increased the selling price per hundredweight. Adding gluten feed to the basal ration increased the rate of gain, the feed required per unit of gain due to the addition of the supplement, the cost of feed, and the selling price per hundredweight, but reduced the margin per head over feed cost.

The rearing of the lambs of the Romanov breed on cow's milk [trans. title], A. F. SMIRNOV (*Yaroslavsk. Zootekh. Opytn. Sta. Raboty* 1926, pp. 102, 103).—Ewes of the Romanov breed being very prolific, often producing four or five lambs at a time, a test was undertaken at the Yaroslavl Zootechnical Experiment Station to determine the value of cow's milk for supplementary feeding. Four lambs were taken from their mother at birth and fed for three months on cow's milk. No harmful effects were observed due to the feeding, and in comparison with twin and triplet lambs nursing their mothers the lambs on cow's milk grew faster.

The individuality of the pig: Its breeding, feeding, and management, R. MORRISON (London: John Murray, 1926, pp. XII+377, pls. 12, figs. 23).—A comprehensive treatise written in a semipopular manner dealing with the breeding, feeding, and management of swine.

The influence of age on the intensity and cost of fattening pigs [trans. title], N. A. POROV (*Yaroslavsk. Zootekh. Opytn. Sta. Raboty* 1926, pp. 122-124).—Sows 2 years' and 4 months of age on a fattening ration made more rapid and economical gains during a 64-day feeding period than sows 5 years and 4 months of age of the same initial weight and on the same ration in tests at the Yaroslavl Zootechnical Experiment Station. To prevent loss in weight during the test all sows that came in heat were bred.

Rations for growing and fattening pigs, A. A. DOWELL (Minnesota Sta., Crookston Substa. Rpt. 1927, pp. 52-54).—Five lots of 10 pigs each were fed from an average initial weight of 58 lbs. to an average final weight of approximately 225 lbs. The grain ration in lots 1, 3, and 5 consisted of ground barley, lot 2 ground oats, and lot 4 barley and shorts. Lot 3 received tankage as a protein supplement, the other lots receiving a protein mixture of 50 per cent of tankage, 25 per cent of linseed meal, and 25 per cent of alfalfa leaves. Lots 1 to 4, inclusive, were run on 0.5-acre plats of rape pasture, and lot 5 was fed in dry lot. All lots had free access to water and a mineral mixture composed of 40 per cent of steamed bone meal, 40 per cent of air-slaked lime, and 20 per cent of salt.

The pigs fed oats developed large middles and at the end of the experiment were rough-coated and lacked in "bloom." Pigs in the other lots remained thrifty throughout the test. The average daily gains were 1.53, 1.18, 1.55, 1.48, and 1.58 lbs. per head daily in the respective lots. It required 111, 139, 107, 111, and 104 days of feeding to bring the respective lots to the approximate weight of 225 lbs.

The feeding of oats resulted in the pigs requiring 87 per cent more grain and 102 per cent more protein supplement to produce 100 lbs. of gain. While adding shorts to the ration slightly increased the rate of gain, it also increased the amount and cost of feed. There was little difference in the rate of gain of pigs fed tankage and those fed the protein mixture. However, the latter pigs required less feed per unit of gain. Feeding in dry lot resulted in more rapid gains at a higher feed requirement per unit of gain, pigs on pasture requiring 13.8 per cent less feed.

The comparative feeding value of oat and barley flour on the gain in flesh by pigs kept in pens under winter conditions [trans. title], N. A. POPOV (Āroslavsk. Zootekh. Opytn. Sta. Raboty 1926, pp. 114, 115).—A basic ration of linseed meal, potatoes, and creamery waste was fed to two groups of three weanling pigs each kept in winter quarters at the Yaroslavl Zootechnical Experiment Station. To the basic ration in one group oat flour was added and in the other group barley flour.

During the 100-day test pigs grew at approximately the same rate on both oat and barley flour, but it required more oat flour to produce 1 kg. of gain. Oat flour was not as palatable as barley flour. No differences in the appearance or taste of the meat were noted, but the lard made from the oat-fed pigs was softer than that from the barley-fed pigs.

The significance of forest and a clover pasture in feeding pigs [trans. title], N. A. POPOV (Āroslavsk. Zootekh. Opytn. Sta. Raboty 1926, pp. 116-122).—Two groups of four 2-months-old pigs each were fed for 90 days at the Yaroslavl Zootechnical Experiment Station on creamery waste and barley flour. One group was placed on a woodlot pasture and the other on clover pasture. There was practically no difference in the gains of the pigs on these types of pasture.

Swine husbandry in central Alberta, F. H. REED and L. T. CHAPMAN (Canada Dept. Agr. Bul. 73, n. ser. (1927), pp. 32, figs. 8).—The results of 13 years of experimental work with swine at the Dominion Experimental Station, Lacombe, Alta., have brought out the following main points:

"Yorkshires are the most prolific, and make more economical gains than either Berkshires or Duroc-Jerseys. Of the different grains used for feeding weaner pigs, oats produced the most economical gains. . . . The earliest farrowed pigs, both spring and fall, usually strike the best market. Fall litters should be farrowed before September 15. Pigs have been raised fairly successfully at all seasons at this station. With our present type of hogs, it is difficult to produce a high percentage of 'select' hogs on the self-feeder. The

most economical gains are made by hand-feeding when the influence of feeding methods on type is considered. Under average winter climatic conditions better and more economical gains can be made by feeding hogs out of doors with well-banked cabins for sleeping quarters. Pasture is essential to the most economical gains. Frosted wheat can be used profitably for feeding hogs. Alfalfa, oat-and-rye mixture, and rape are the three best hog pastures under central Alberta conditions. Exercise is very important for brood sows, breeding boars, and the development of breeding stock."

Digestibility and production coefficients of poultry feeds, G. S. FRAPS (*Texas Sta. Bul. 372 (1928), pp. 24*).—The digestion coefficients, as determined in 63 experiments at the Texas Experiment Station, and a compilation of all digestion trials with poultry which have been reported are noted in this publication. The variations found have been studied statistically. The approximate average and minimum chemical composition, digestible protein, and productive energy for a number of poultry feeds are given.

It has been determined that poultry have little power to digest crude fiber in comparison with the power of digestion for this nutrient by ruminants (*E. S. R., 54, p. 60*). There is little difference in the digestive powers of poultry and ruminants for feeds low in crude fiber. More variation was observed in the digestion coefficients for protein and ether extract for poultry than for ruminants. The composition and feeding values of mixed feeds for poultry can be calculated from the data given.

Poultry feeding stuffs and rations, A. R. WINTER (*Ohio Agr. Col. Ext. Bul. 63 (1927), pp. 16, figs. 6*).—A compilation of the most reliable information known at the present time concerning protein feeds, cereal grains and by-products, mineral feeds, and vitamins, and their use in poultry rations.

[Experiments with poultry at the Crookston Substation], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1926, pp. 56, 57*).—The results of experiments in continuation of those previously noted (*E. S. R., 56, p. 566*) are reported.

Grading up the farm flock.—Three years' tests, starting with eggs from mongrel birds and breeding the resulting pullets to purebred males, have been completed. The yearly average of the flock of mongrels was 55 eggs, for the best layer 94 eggs, and for the best 10 layers 74 eggs. The corresponding figures for the first purebred cross were 68, 102, and 87 eggs and for the second purebred cross 90, 119, and 99 eggs, respectively. Fertility and hatchability showed marked improvement, as did also the size, color, and type of the birds through the use of purebred sires.

Incubation.—Eggs set in March hatched 28 per cent, in April 49, in May 58, and in June 48 per cent, indicating the value of sunshine for vigor and vitality in the birds and fertility of the eggs.

Cost of a mature pullet.—Records of the feed, coal, and labor used in producing 1,100 pullets to laying age (24 weeks) showed the cost to be approximately 46 cts. each. This cost does not include the value of baby chicks or depreciation on buildings and equipment.

Pullet production in relation to time of hatching.—Trap-nest records showed that March pullets produced fewer eggs during the year than April-hatched pullets, due to the early pullets going into a midwinter molt. April pullets had a higher production than May pullets, and the latter were higher in production than June pullets.

[Poultry experiments at the Crookston Substation], A. A. DOWELL (*Minnesota Sta. Crookston Substa. Rpt. 1927, p. 55*).—The results of two experiments are briefly noted.

Cod-liver oil.—Two lots of 225 April-hatched White Leghorn pullets each were fed from November 1 to May 1 on the same basal ration, to which was added for 1 lot 1 per cent of cod-liver oil. The average monthly egg production for the lot receiving cod-liver oil was 53 per cent. The average fertility, hatch, and mortality for the season for this lot were 95, 65, and 1.7 per cent, respectively. The corresponding figures for the lot receiving no cod-liver oil were 48, 81, 46, and 3.7 per cent.

Winter egg production as a guide to total yearly production.—Trap-nest records show that pullets laying over 50 eggs during the four winter months usually lay over 200 eggs during the year, while those with lower winter records seldom reach the 200-egg production mark.

Egg production, monthly costs, and receipts on New Jersey poultry farms, November, 1926—October, 1927, L. M. BLACK (*New Jersey Stas. Hints to Poultrymen*, 16 (1928), No. 4, pp. 4, fig. 1).—In continuing this study (E. S. R., 56, p. 768), data for the period November, 1926, to October, 1927, are reported from 30 farms located in different sections of the State.

Poultry management at the University of New Hampshire, A. W. RICHARDSON (*N. H. Univ. [Agr.] Ext. Bul.* 32 (1927), pp. 32, figs. 5).—A popular publication presenting the methods of breeding, feeding, incubation, brooding, housing, and management as practiced at the University of New Hampshire poultry plant.

The effect of various rations on the storage quality of eggs, R. M. SHERWOOD (*Texas Sta. Bul.* 376 (1928), pp. 12).—Rations containing varying proportions of cottonseed meal, cottonseed oil, and alfalfa leaf meal in the mash were fed to laying hens to determine their effect on the storage quality of the eggs laid by these hens.

Every second week after March 15 a case of eggs laid by the hens on the 12 rations used was placed in cold storage until 9 cases had been stored. None of the eggs had been laid more than 4 days when placed in storage. The eggs were candled on July 1 and 27, September 9, and October 5, and graded as firsts, seconds, and discards.

None of the eggs showed any serious discoloration of either white or yolk when they were first laid, nor was any change in color noted until the case had been in storage for 4 weeks. Rations containing 20 or 32 per cent of cottonseed meal produced eggs which began to discolor after 4 weeks in storage, while a mash containing 9 per cent of cottonseed meal produced eggs which retained their good color for at least 28 weeks in storage. An all-mash ration containing 9 or 12 per cent of cottonseed meal produced eggs that began to deteriorate after 4 weeks' storage, while the same type of ration containing 3 or 6 per cent of cottonseed meal produced eggs retaining their good color for 28 weeks.

One per cent of crude cottonseed oil did not cause discoloration of eggs, even after 20 weeks' storage. Liberal supplies of fresh succulent green feed improved the storage quality of the eggs.

Raising turkeys, J. H. MARTIN (*Ky. Agr. Col. Ext. Circ.* 217 (1927), pp. 16, figs. 2).—Popular directions are given for the breeding, feeding, and management of turkeys. The common parasites and diseases are discussed and remedies offered to combat or prevent them.

Rabbit breeding, G. ROBERTSON and W. W. LEE (*Canada Dept. Agr. Bul.* 28, n. ser., rev. ed. (1927), pp. 29, figs. 17).—This is a revised edition of this bulletin, previously noted (E. S. R., 50, p. 474).

DAIRY FARMING—DAIRYING

Dairy work at the Woodward Field Station, Woodward, Okla., 1921 to 1926, C. J. STAUBER, D. STUART, and R. R. GRAVES (*U. S. Dept. Agr. Circ. 12* (1927), pp. 24, figs. 5).—The results of feeding and management practices, production records, studies on growth and cost of raising dairy heifers, and pasture and breeding experiments conducted during the period 1921 to 1926 are reported.

The data obtained in the pasture experiments include date of seeding, length of season, number of cow-days of pasture per acre, date on which pasture was available, and the value of the feed obtained for Sudan grass, winter rye, winter wheat, and sweet clover. For a number of years, varying from 1 to 6, Sudan grass returned an average value of \$12.50 per acre, sweet clover \$10.89, winter wheat \$8.76, and winter rye \$7.60. Winter wheat and rye could not be depended upon for fall and winter pasture and, when allowed to reach sufficient growth to provide plenty of feed, March 9 was the earliest date at which pasture was available. Winter wheat and rye, sweet clover first year, and Sudan grass drilled furnished 74, 76, 160, and 127 days, respectively, of pasture.

Care of the dairy cow at calving time, J. B. SHEPHERD (*U. S. Dept. Agr. Leaflet 10* (1928), pp. 4, fig. 1).—Popular directions are given for the care and feeding of dairy cows before, during, and after calving. Notes on the care of the newborn calf, together with some of the troubles incident to calving and treatments for such cases, are also included.

Maintenance requirements for calves tested by live weight methods, O. H. ECKLES, T. W. GULLICKSON, and W. M. NEAL (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 431-438, fig. 1).—The Minnesota Experiment Station found in tests with 15 Holstein calves of different ages that the net energy required to maintain dairy calves in normal flesh is about 90 per cent of that recommended by Armsby (*E. S. R.*, 38, p. 268). Three experiments following three different procedures were conducted in arriving at this conclusion.

Variation in the composition of milk and its control by the dairy farmer, H. T. CRANFIELD (*Midland Agr. and Dairy Col. Bul. 15* (1927), pp. 14, figs. 3).—The author reports results of a study of the composition of milk from 15 herds of cattle situated in different sections of England. In all 732 samples of milk were analyzed, and observations were made on herd and farm management.

The milk analyses showed a variation in fat content from as low as 2.2 to as high as 5.8 per cent. The solids-not-fat varied in percentage from 7.99 to 9.51 per cent. The factors affecting fat and solids-not-fat content are enumerated and discussed. Recommendations based on the present knowledge of the factors involved that will minimize the production of milk of poor quality are given.

Variation in the solids not fat content of the milk of a herd of cows in Leicestershire during 1923-26, H. T. CRANFIELD (*Midland Agr. and Dairy Col. Bul. 11* (1927), pp. 15, figs. 2).—A study of the milk from a herd of 30 to 35 Shorthorn cows of good type and under reasonable feeding and management showed that at times milk was produced below the 8.5 per cent standard for solids-not-fat. The factors influencing the solids-not-fat percentage of this herd were individuality, period of lactation, weather conditions, period of year, and feeding.

Clean milk and its production, E. G. CARTER (*Utah Sta. Circ. 69* (1928), pp. 16, figs. 7).—After defining clean milk, the author points out its food value in comparison with other foods, the dangers from impure milk, the bacteria present in milk, and the value of pasteurization. Methods for producing clean milk are also given.

Modern methods of testing milk and milk products, L. L. VAN SLYKE (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner &*

Co., 1927, 3. ed., rev., pp. XII+344, figs. 54).—In revising this text (*E. S. R.*, 33, p. 298), new and improved methods of testing butter, skim milk, buttermilk, and ice cream are incorporated. The chapter on the biochemical conditions of milk and cream has been largely rewritten, and material on testing, scoring, and judging ice cream has been added.

The effect of different pasteurization temperatures on several of the physical properties of milk, W. H. E. REID (*Milk Dealer*, 17 (1927), No. 3, pp. 66-69, figs. 11).—In this study at the Missouri Experiment Station the regular practices of the market milk plant were followed except as to the temperatures at which the milk was pasteurized. Samples of milk were taken before pasteurization. The milk was heated in varying tests to 140, 142, 145, 150, and 155° F. and held for 30 minutes. A sample of the pasteurized milk was then taken and cooled immediately to 40°. Microphotographs were made of the whole milk, skim milk, and cream before and subsequent to pasteurization. The viscosity of all samples was determined with the improved McMichael viscometer and the surface tension with the Du Nouy apparatus at 68°, and the specific gravity was determined at 60°.

The length of the cream column was decreased with each increase in pasteurization temperature except at 142°, which averaged 0.47 per cent (by volume) more cream than did 140°. After aging 24 hours the cream column at 150° was 27.54 per cent less than at 140°. The microphotographs showed this difference in the length of the cream column, and also showed that the number of fat globules in the skim milk increased with the increase in temperature. Pasteurizing at temperatures above 145° retarded the gravitation of the fat globules, especially the small globules. As the temperature of pasteurization increased the viscosity decreased slightly. Increasing the pasteurization temperature increased the surface tension and the specific gravity to a slight extent.

A study of "flaky" milk, F. S. JONES and R. B. LITTLE (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 439-447).—Studies at the Rockefeller Institute for Medical Research showed that "flaky" milk is characterized by the irregular appearance of floccules composed of masses of leucocytes and mucus. The organisms found were of the same type as those found in mastitis. Conditions causing flaky milk suggest a mild but prolonged mastitis, accompanied by an increased number of leucocytes and a relatively high-blood protein elimination.

The cream plug: Its causes and prevention, H. H. SOMMER and K. M. ROYER (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 416-430, figs. 5).—Work at the Wisconsin Experiment Station has proved that the cream plug is due to the presence in the cream of large fat globules which rise into a dense layer and coalesce. In various tests it was found that any process that tended to cause clumping of the fat particles, such as agitation at high temperature, freezing, and improper methods of pasteurizing and cooling, increased the tendency to formation of cream plugs. Homogenization and emulsification eliminated the cream plug trouble. Storing at low temperatures helps prevent the formation of the plug, since the serum through which the fat globules pass is more viscous at the lower temperatures.

Mold and yeast counts and their relation to the composition of butter, H. MACY (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 384-395, figs. 3).—Samples of 2,700 lots of butter of varying composition, age, and quality were studied at the Minnesota Experiment Station. The samples were taken from 60-lb. tubs, and 1 cc. of the melted sample plated on whey agar to which 1 cc. of 1 per cent sterile tartaric acid solution had been added. The plates were incubated at room temperatures (68 to 77° F.) for three days before mold and yeast counts were made.

The moisture content of the butter bore no direct relationship to the counts. However, as the salt content of the butter increased the mold and yeast counts decreased. The same was true of the percentage of "salt in brine" in relation to the counts. The higher concentrations of salt and salt in brine had more marked effects for the mold than for the yeast counts.

Camembert cheese from pasteurized milk, W. HOCHSTRASSER and W. V. PRICE (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 448-459).—Methods of manufacturing Camembert cheese from pasteurized milk were studied at the New York Cornell Experiment Station. Twenty-five paired tests were conducted with milk from different sources and of different grades. One of each pair of cheeses was prepared from milk pasteurized at 145° F. for 30 minutes. The effect of starter and the influence of rennet on the quality of the curd was noted. Analyses for fat and total solids were made of the milk, whey, and green and ripened cheese. Scoring was done by members of the department of dairy industry. In lots 1 to 15, 80 lbs. of milk was divided in half and each part made into 10 cheeses, while in lots 16 to 25, 120 lbs. of milk was used and each vat made into 15 cheeses.

The difference in the scores of lots 1 to 15 was 4.82 points in favor of the cheese from pasteurized milk. In lots 16 to 25 the difference was 3.88 points in the same favor. The average quality and uniformity of the cheese was greater when pasteurized milk was used, but the improvement in quality due to pasteurization was greatest when the raw milk was of poor quality. In this test from 4 to 5 per cent of starter brought about the desired condition of the curd in the pasteurized milk. Four oz. of rennet per 1,000 lbs. of milk gave a good coagulation of the milk and a proper firmness to the curd. No difference in the yield of cheese was found due to pasteurization. When the amount of starter added to the milk was of the correct quantity, the loss in weight was practically the same in both types of cheese. The amount of fat and total solids in the cheese from pasteurized milk was not enough greater to be significant, and there was no significant difference in the amount of these constituents lost in the whey. The keeping quality was practically the same in both methods.

A bacteriological study of cottage cheese, M. M. DIEHM (*N. Y. Prod. Rev. and Amer. Creamery*, 65 (1927), No. 9, pp. 338-341).—The author has made a bacteriological study of ten samples of cottage cheese bought at different places and under different conditions, and has determined the number and predominating type of organisms present and the acidity of each sample.

In the quantitative study, dilutions of 1:100, 1:10,000, and 1:1,000,000 were made and plated on plain and litmus milk agar in duplicate. One set of plates was kept at room temperature (68° F.) and the other set at incubator temperature (98.6°). After 24 hours the colonies were counted on the 1:1,000,000 dilution, the others giving rise to so many colonies that it was impossible to count them. The greatest number of colonies appeared from a sample that had been exposed for several hours without ice, while the fewest were from a sample purchased shortly after delivery and which had been on ice from the time it was prepared. More colonies appeared on the plates kept at incubator temperature than on those at room temperature.

The average acidity of the samples in terms of lactic acid was 1.167 per cent. One sample of the "sweet curd" type with an acidity of 0.774 per cent had no sharp acid taste.

Streptococcus lactis was the predominating organism in the samples tested, and either *Oidium lactis* or *O. asteroides* was present to govern the action of the

S. lactis. The streptococci predominated on the plates held at incubator temperature and the Oldium on the plates at room temperature. A sarcina and a white yeast were isolated from several samples, but were thought to be neither beneficial nor detrimental from their action on the various media.

Graphical standardization of condensed milk products, W. V. PRICE (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 377-383, fig. 1).—The author presents and illustrates a graphic method of standardizing condensed milk products, which may also be used to standardize off batches of these products.

Ice cream, G. D. TURNBOW and L. A. RAFFETTO (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. IX+407, figs. 106*).—A textbook for the student and manufacturer divided into the following sections: History and development of the ice cream industry, classification and specialties, colors and flavors, the use of fruits in ice cream and ices, ingredients of the mix, calculations of the ice cream mix, processing, bacteria in ice cream, defects in ice cream, methods of analyzing dairy products used in ice cream making, engineering in the ice cream plant, and merchandising.

Bacteriological methods of examining ice cream, A. C. FAY ET AL. (*Jour. Dairy Sci.*, 10 (1927), No. 5, pp. 460-478).—A preliminary report submitted by the subcommittee on bacteriological methods on examining ice cream of the American Dairy Science Association. It is stated that the proposed methods of sanitary control will be revised in accordance with suggestions and the judgment of the committee before a final adoption.

The effect of overrun, temperature, and composition on the dipping losses of ice cream, H. R. BIERMAN (*Maryland Sta. Bul.* 293 (1927), pp. 23-34).—Ice cream mixes of 10 different compositions were dipped into standard quart pails. A mix containing 12 per cent of fat, 10 per cent of milk solids-not-fat, 15 per cent of sugar, and 0.3 per cent of gelatin was considered as standard. The other mixes differed from the standard in having 0.5, 0.4, and 0.0 per cent of gelatin, 9 or 15 per cent of fat, 8 or 12 per cent of milk solids-not-fat, and 12 or 18 per cent of sugar. All mixes were pasteurized in the usual manner, viscolized at 2,500 lbs. pressure at 120° F., cooled to 35°, and aged for 24 hours. Twenty-four 5-gal. cans of vanilla ice cream of each composition were frozen, six cans each at approximately 60, 80, 100, and 118 per cent overrun. The cans were filled level full, weighed, and stored in the hardening room for 4 days before dipping. Part of the dipping, which was done with a long-handled spoon, was done in the hardening room and part from an ice cream cabinet.

It was found that 20 quarts of bulk ice cream with overruns of 60, 80, 100, and 118 per cent dipped on the average of 17.0, 15.4, 14.1, and 13.5 qt., respectively. The quarts dipped from mixes with the above overruns weighed on the average 27.1, 26.5, 26.3, and 25.1 oz., respectively.

Gelatin had practically no effect on dipping losses. Fifteen per cent fat content decreased losses slightly, while 18 per cent sugar and 12 per cent milk solids-not-fat content caused increases in dipping losses.

The most satisfactory temperature for dipping the standard mix was 8° F. or lower, and for each 1 per cent of difference in sugar content the dipping temperature should be varied inversely 1 to 1.5°. Dipping at 8° or lower is only practical when the overrun is approximately 90 per cent. Quarts of ice cream dipped below 8° weighed 1.1 oz. less than quarts dipped at from 9 to 16°. This decrease in weight is offset by having the product remain firm for a longer period.

The author believes that legislation requiring ice cream to be sold by weight without regulating the maximum overrun should be abandoned.

VETERINARY MEDICINE

Dictionary of bacteriological equivalents, French-English, German-English, Italian-English, Spanish-English, W. PARTRIDGE (*London: Baillière, Tindall & Cox; Baltimore: Williams & Wilkins Co., 1927, pp. XI+141*).—The equivalents for about 2,400 French, 2,600 German, 1,200 Italian, and 1,600 Spanish words are given.

Medical mammalogy [trans. title], I, II, M. NEVEU-LEMAIRE (*Ann. Parasitol. Humaine et Compar., 5 (1927), Nos. 2, pp. 143-176; 3, pp. 252-278; 4, pp. 356-380; 6 (1928), No. 1, pp. 107-131*).—The first part (pp. 143-176, 252-278) of this contribution deals with the mammalian carriers of the virus of infectious diseases of man, and includes a list of such mammals with the pathogenic organisms that they harbor, a list of the pathogenic organisms and their hosts, and a bibliography of four pages. The second part (pp. 356-380, 107-131) contains a list of the intermediate mammalian hosts or carriers of parasites of man, with the parasites they harbor, a list of the parasites and their hosts, and a list of 25 references to the literature.

Report of the chief veterinary surgeon for the year ended 30th June, 1926 (*N. S. Wales Dept. Agr., Rpt. Chief Vet. Surg. 1926, pp. 6*).—This report includes notes on the occurrence of infectious diseases of livestock in New South Wales.

Combating animal diseases (*Philippine Bur. Agr. Ann. Rpt., 26 (1926), pp. 76-84, pls. 7*).—This account deals at length with the control of rinderpest, the use of rinderpest vaccine, and work with several other diseases. An account of the work at the Veterinary Research Laboratory with rinderpest vaccine, antirinderpest serum, etc., follows.

Santonin in veterinary practice, L. A. MEBILLAT ET AL. (*New York: B. Pressman Co., 1926, pp. 43, figs. 2*).—A practical summary of information on this anthelmintic.

Wild Tobaccos (*Nicotiana trigonophylla* Dunal and *Nicotiana attenuata* Torrey) as stock-poisoning plants, C. D. MARSH, A. B. CLAWSON, and G. C. ROE (*U. S. Dept. Agr., Tech. Bul. 22 (1927), pp. 23, figs. 14*).—The loss of cattle near Holbrook, Ariz., thought to have been due to *N. trigonophylla*, led to the investigations here reported.

The experimental work, details of which are here given, showed that this plant is distinctly poisonous to cattle, sheep, and horses, producing typical tobacco symptoms. The poisonous effects appeared very soon after feeding and in some cases continued for a considerable period. In the experimental work cattle were much more susceptible than sheep, the susceptibility of horses being about the same as that of cattle. Fatal results, however, were much more liable to occur with cattle than with the other animals. It is pointed out that the remedy for such poisoning on the range lies in prevention, by taking care that animals have a sufficient supply of other forage, and in the destruction of the plant.

The symptoms produced by *N. attenuata* are closely identical with those produced by *N. trigonophylla*, but the toxic and lethal dosages of the former are somewhat greater. While there is a possibility of the poisoning of chickens by *N. attenuata*, the dosage required is so heavy that it probably never occurs except as produced experimentally.

A list is given of 17 references to the literature.

The preservation of complement in various gaseous environments with special reference to carbon dioxide, G. VALLER and J. G. McALPINE (*Jour. Bact., 15 (1928), No. 1, pp. 44, 45*).—The procedure described furnishes a means of preserving and storing left-over diluted complement as well as fresh

undiluted complement for reasonable periods of time, and thus eliminates the necessity of collecting complement daily.

Technique of BCG culture: Preparation, conservation, and control of the nonvirulent vaccine emulsions [trans. title] (*Ann. Inst. Pasteur*, 41 (1927), No. 3, pp. 358-368, pl. 1).—A detailed account is given of this vaccine, which is derived from an extremely virulent bovine virus, cultured and re-cultured at 20-day intervals during a 18-year period exclusively upon 5 per cent glycerinated beef bile until its virulence was lost.

Studies on the metabolism of the abortus-melitensis group, II, III, J. G. MCALPINE and C. A. SLANETZ (*Jour. Infect. Diseases*, 42 (1928), No. 1, pp. 66-72, figs. 2; pp. 73-78, fig. 1).—The second and third parts of this series of studies (E. S. R., 56, p. 877) are here presented.

II. Further observations on nitrogen metabolism.—"By the methods employed in this study, it has been shown that *Bacterium abortus* of bovine origin utilizes very little or no glucose in its metabolic activity. On the other hand, *B. abortus* of porcine and human origin and *B. melitensis* consumed from 4 to 18 per cent of this carbohydrate for growth energy. Because of this difference in sugar metabolism, *B. abortus* bovine can be differentiated from *B. abortus* porcine and human, and from *B. melitensis* by the different amounts of the various nitrogen fractions present in the culture medium over a 14-day incubation period. This difference is apparent only in glucose-containing media. Carbon dioxide, 10 per cent, stimulates the growth of *B. abortus* bovine even though the strains may have become accustomed to aerophilic conditions, but it partially inhibits the multiplication of *B. abortus* porcine and human and *B. melitensis*. This inhibition may be due to slight change in hydrogen-ion concentration caused by the carbon dioxide, and perhaps partly to a decrease in oxygen supply in the closed, as compared with the open, culture system."

III. Glucose utilization.—"Quantitative sugar determinations made by the Somogyi and Benedict methods, and pH determinations according to the colorimetric method of Clark, when Fairchild's peptone is employed in the medium, show that the *B. abortus-melitensis* group may be split into two main parts. The first of these includes all strains which are unable to utilize more than 2 per cent of glucose. The second group includes those which use from 5 to 20 per cent of the carbohydrate and is made up of *B. abortus* of human and porcine origin and *B. melitensis*. These results were consistent with a large number of strains, barring one exception. This was a bovine strain which showed from 8 to 10 per cent utilization. It is not unlikely that in some instances cows become infected with the porcine strain of the organism. All of the human strains were apparently more closely related to the porcine strains than they were to those of bovine origin."

Report of a case of abortion induced by *Vibrio fetus*, E. H. BARGER (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 4, pp. 468-474).—The author reports upon two cases of vibronic abortion which occurred in a herd free from *Bacterium abortus* infection. There was no marked spread of the infection despite the absence of isolation measures.

Some observations on "Anaplasma" [trans. title], E. DSCHUNKOWSKY (*Arch. Schiffs u. Tropen Hyg.*, 31 (1927), No. 12, pp. 562-573, figs. 4).—This contribution from the Central Hygienic Institute at Belgrade deals with the relationship and biology of forms of *Anaplasma* and *Theileria*.

A serological study of undulant fever in Southern Rhodesia, G. R. ROSS (*Jour. Hyg. [London]*, 26 (1927), No. 4, pp. 403-419).—An examination of nine type strains of *Brucella*, collected from various sources, by agglutination and agglutinin-absorption tests showed a distinct serological difference between

B. abortus and *B. melitensis*. Differentiation could only be made by the agglutinin-absorption test, both organisms agglutinating equally with *abortus* or *melitensis* immune sera. By agglutination alone differentiation could be made between a group consisting of *B. melitensis* and *B. abortus* strains on the one hand and a group which included one strain labeled *B. melitensis*, one labeled *B. abortus*, and *B. paramelitensis*. The agglutinin-absorption test showed that this *B. paramelitensis* group comprised two strains of closely allied *paramelitensis* strains and that the *B. abortus* strain could be regarded as a *B. para-abortus* strain. Serological investigation of eight strains of *Brucella* isolated from patients suffering from undulant fever in Southern Rhodesia showed that six were serologically identical with type *B. abortus* and two identical with what is regarded as a *B. para-abortus* strain. It is suggested that the *melitensis-abortus* group represent the "S" normal types, whereas the *paramelitensis-para-abortus* group represent the "R" mutant types of organisms.

A list is given of 24 references to the literature.

A comparison of *B. chauvoei* strains from cattle and sheep, E. JUNGHERB (*Jour. Infect. Diseases*, 42 (1928), No. 1, pp. 84-92).—This contribution from the Montana Experiment Station reports upon comparative laboratory studies of ovine strains of *Bacillus chauvoei* from Montana sheep blackleg outbreaks and recognized bovine strains of *B. chauvoei*. Cultural, biochemical, guinea pig protection, and cross-agglutination tests failed to distinguish between them. Sheep-inoculation experiments conducted at the station indicated a wide variation of virulence among *B. chauvoei* strains of either bovine or ovine origin.

Epizootic lymphangitis ([War Dept. U. S.], *Off. Surg. Gen., Vet. Bul.*, 20 (1927), No. 5, p. 214; also in *Vet. Med.*, 24 (1928), No. 1, p. 36).—Of all the agents tested by the Medical Department Research Board at Manila, P. I., mercuric iodide has given the most satisfactory results in the treatment of epizootic lymphangitis. Three of four horses treated made complete recovery. The treatment consists in incising soft nodules present to evacuate the pus, and giving daily intravenous injections of 0.50 gm. of mercuric iodide suspended in 60 cc. of sterile distilled water over a period of 10 days.

Symposium on foot and mouth disease (*Ann. Appl. Biol.*, 15 (1928), No. 1, pp. 124-144, fig. 1).—The papers presented at a symposium on foot-and-mouth disease held by the Association of Economic Biologists November 18, 1927, are as follows: Foot and Mouth Disease in Farm Animals, by F. C. Minett (pp. 124-130); Experimental Foot and Mouth Disease in Small Animals, by J. A. Arkwright (pp. 130-136); Physical Properties of the Foot and Mouth Virus, by S. P. Bedson (pp. 136-139); Survival of the Virus Outside the Body, by Y. M. Burbury (pp. 139-142); and Demonstration of the Lesions of Foot and Mouth Disease in Guinea-Pigs, by I. A. Galloway (pp. 143, 144).

Some epidemiological observations on foot-and-mouth disease, with special reference to the recent experience of Holland, M. GREENWOOD (*Jour. Hyg. [London]*, 26 (1927), No. 4, pp. 465-489, fig. 1).—The subject is presented under the headings of recent history of foot-and-mouth disease in England and Wales and foot-and-mouth disease in the Netherlands, followed by some deductions.

Piroplasma gibsoni Patton, 1910, M. ANANT NARAYAN RAO (*Indian Jour. Med. Research*, 14 (1927), No. 4, pp. 785-800, pls. 2, figs. 4; also in *Indian Vet. Jour.*, 4 (1928), No. 3, pp. 245-260, pl. 1, figs. 4).—A report of studies of this parasite, which was first discovered by Patton in 1910 (*E. S. R.*, 23, p. 792) affecting hounds in Madras. Transmission experiments with *Haemaphysalis bispinosa*, the tick most common on jackals and hounds, proved negative.

Bovine piroplasmoses: The East Coast fever and North African theileri-
osis [trans. title], E. SERGENT, A. DONATIEN, L. PARROT, F. LESTOQUARD, and E.

PLANTUREUX (*Ann. Inst. Pasteur*, 41 (1927), No. 5, pp. 489-506, figs. 3).—This is a detailed account of studies, noted from another source (E. S. R., 58, p. 676), which have led to the conclusion that *Theileria dispar* and *T. parva* are distinct species.

The present state of immunization against bovine piroplasmosis in Argentina [trans. title], J. LIGNIÈRES (*Rev. Zootéc. [Buenos Aires]*, 13 (1926), No. 156, pp. 273-282; *Portug. trans. in Bol. Agr. [São Paulo]*, 28. ser., 1927, No. 1, pp. 69-78; abs. in *Rev. Appl. Ent.*, 15 (1927), Ser. B, No. 9, p. 157).—This is a review of the status of vaccination against bovine piroplasmosis as worked out by the author during the past 25 years.

On the differentiation of the staphylococci, with special reference to the precipitin reactions, L. S. DUDGEON and J. W. H. SIMPSON (*Jour. Hyg. [London]*, 27 (1928), No. 2, pp. 160-173).—The authors investigated 50 strains of *Staphylococcus aureus* and 30 strains of *S. albus* obtained from infective processes in man. Such cultural reactions as were completed did not differentiate between strains of *S. aureus* and *S. albus* or serve to group these staphylococci. However, 94 per cent of the *S. aureus* strains fermented mannite and only 40 per cent of the *S. albus* strains. A close degree of correlation between pathogenicity for rabbits, pigment formation, and biochemical activity was noticed among the *S. aureus* strains. Nineteen of 25 cultures of *S. aureus* killed rabbits, but only 3 of 18 cultures of *S. albus*.

The study of the precipitin reactions failed to show any hard and fast dividing line between staphylococci of different colors or of different cultural reactions. The authors are inclined to agree with other investigators that the pyogenic, Gram-positive staphylococci must be regarded as members of one common family.

Historical survey of researches on the streptococci (with special reference to the importance of differential media and microphotography as an aid to their classification and identification), D. and R. THOMSON (*Ann. Pickett-Thomson Research Lab.*, 3 (1927), pp. VI+316, pls. 57, figs. 9).—In this extended account of the streptococci, particular attention is given to their biochemical reactions (pp. 21-73), the soluble products produced (pp. 73-79), vitality (pp. 80-85), virulence (pp. 85-104), and immunity reactions (pp. 104-129). One of the 25 parts of the work, which relates to the differentiation and classification of the nonhemolytic streptococci by the use of Crowe's medium, is by H. W. Crowe (pp. 251-269). A bibliography of 21 pages and author and subject indexes are included.

The function of the spleen in animals infected with *Trypanosoma equinum* [trans. title], E. SAVINO (*Compt. Rend. Soc. Biol. [Paris]*, 97 (1927), No. 29, pp. 1249, 1250).—The author finds that insulin, which causes a reduction, and glucose, an increase, in the number of trypanosomes (*T. equiperdum*) in the blood, as previously reported,* do not cause a variation in the number of trypanosomes in the blood of dogs infected experimentally with *T. equinum* if their spleens have been extirpated or enervated. This action of the spleen can not be explained alone by the variation in volume of the organ having an influence on the volume of blood, but rather by its removal or discharge of the trypanosomes in a selective way. This function is influenced by the nervous system and not by a variation in the glycemia.

Does the dourine trypanosome traverse the sound skin or mucous membrane? [trans. title], E. IWANOW and F. MESNIL (*Ann. Inst. Pasteur*, 41 (1927), No. 5, pp. 507-512).—Experiments conducted lead the authors to conclude that *Trypanosoma equiperdum* does not possess the power to gain en-

* *Compt. Rend. Soc. Biol. [Paris]*, 96 (1927), No. 3, pp. 220, 221.

trance through the integument of the animal, since it can not penetrate the unbroken skin nor mucous membrane.

Tubercle bacilli in the feces of apparently healthy cows, R. S. WILLIAMS and W. A. HOY (*Jour. Hyg. [London]*, 27 (1927), No. 1, pp. 37-39).—An examination made at the National Institute for Research in Dairying of samples of the feces of 391 cows from various parts of England and Wales in apparently good health resulted in finding that six of the cows excreted tubercle bacilli. Twenty-four cows were reactors to the tuberculin test, but the others had not been tested. No tubercle bacilli were found in the feces of the 24 tested cows. No reference is made to post-mortem findings.

Specific infectious cystitis and pyelonephritis of cows, F. S. JONES and R. B. LITTLE (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 4, pp. 462-467).—An account is given of a specific infectious disease of the cow involving the bladder, ureters, and kidneys. It appears that the condition is independent of other disease processes, and that the causative organism occurs in the urinary tract only.

Contribution to the study of lathyrism in bovines, M. BUISSIÈRE (*Contribution à l'Étude du Lathyrisme chez les Bovins. Thesis, École Natl. Vét. Alfort*, 1926, pp. 51).—This reports upon studies of the chronic poisoning of bovines caused by the leguminous plant *Lathyrus clymenum*, known as purple vetch. The poisoning is caused by the green flowering plant, the symptoms being those of paraplegia, with complete prostration. The toxic principle, which is accumulative, particularly in the nervous system, has not been identified.

Hypoglycemia theory of milk fever, L. AUGER (*North Amer. Vet.*, 9 (1928), No. 2, pp. 26-39, fig. 1).—An extended discussion which led to the conclusion that guanidine is a substance near to insulin, and that it causes hypoglycemia.

Cholesteremia following mammary insufflation in the cow [trans. title], R. MOUSSU (*Rec. Méd. Vét.*, 103 (1927), No. 12, pp. 219, 220).—The author has found that insufflation of the udder results in an increase in the cholesterol content of the blood that may exceed 85 per cent. This variation is independent of and not the result of arrested lactation.

The story of the cattle-fever tick: What every southern child should know about cattle ticks (*U. S. Dept. Agr., Misc. Pub. 2* (1927), pp. 19, figs. 27).—This is a revision of an earlier publication (*E. S. R.*, 39, p. 289).

Trichostrongylosis in calves [trans. title], E. A. R. F. BAUDET (*Tijdschr. Diergeneesk.*, 55 (1928), No. 3, pp. 115-120, figs. 4; *Eng., Fr. abs.*, p. 120).—A description is given of *Cooperia oncophora* found in the intestinal canal of a calf which died showing symptoms of emaciation and diarrhea, for which this worm is considered to have been responsible.

Acidosis of pregnant ewes: So-called pregnancy disease of sheep, W. W. DIMOCK, D. HEALY, and J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 4, pp. 511-516, fig. 1).—This is a contribution from the Kentucky Experiment Station on a condition due to acidosis. In this so-called pregnancy disease of sheep the urine is acid, contains a precipitate, acetone, albumin, and a markedly increased quantity of ammonia, and the buffers of the blood are exhausted. The treatment thus far has proved unsatisfactory and investigational work is still under way.

The enzootic paraplegia of lambs [trans. title], E. BARRAT (*Rev. Vét. [Toulouse]*, 79 (1927), Sept., pp. 506-510).—The study of enzootic paraplegia in lambs made by the author in 1925 and 1926 has shown that it may be due to food poisoning as well as to the bacillus of Frelsz-Nocard.

Anemia in young pigs, L. P. DOYLE, F. P. MATHEWS, and R. A. WHITING (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 4, pp. 491-510, figs. 13).—The data

given in this contribution from the Indiana Experiment Station have been noted from another source (E. S. R., 58, p. 280).

An experimental study of the tineae or dermatomycoses of the horse and the immunity thereto [trans. title], BROcq-ROUSSEU, A. URBAIN, and J. BAROTTE (*Ann. Inst. Pasteur*, 41 (1927), No. 5, pp. 513-553, figs. 2).—A systematic determination of the forms obtained from horses from 40 distinct sources and diverse regions showed 72.5 per cent to represent the microsporoses, 25 per cent the trichophytoses, and 2.5 per cent favus. A bibliography of 62 titles is included.

Bacteriologic studies on the etiology of periodic ophthalmia in the horse, E. C. ROSENOW (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 4, pp. 419-458, figs. 14).—During the course of an extended investigation of this affection of the horse, a peculiar bacillus has been isolated, often in conjunction with a diplococcus, from the fluid or exudate in the anterior chamber in the early stages of attacks of periodic ophthalmia, and somewhat later from emulsions of affected tissues. The organism has been consistently obtained, often in large numbers, from suspected feeds such as hay and oats, and less often from the water supply on farms where the disease existed and far less commonly from farms where the disease had not occurred.

The bacillus and the toxin which it produces were found to have an affinity for the eye when injected intravenously. A condition closely resembling the acute stages of the disease clinically and histologically has been reproduced by intraocular inoculation of material from within acutely affected eyes proved to contain the organism, of dilutions of pure cultures of the organism as isolated and after many subcultures, and during four successive passages through animals.

The conclusion that this bacillus has etiological significance is considered warranted, and the name *Flavobacterium ophthalmiae* is proposed. The infection in the eye appears to be hematogenous, the alimentary tract being the portal of entry and various feeds or water its source.

Treatment of the pneumonias of the horse with antistreptococcus serum, G. J. L. PARANT (*Contribution a l'Étude du Traitement des Pneumonies du Cheval par le Sérum Antistreptococcique. Thesis, École Natl. Vét. Lyon, 1927*, pp. 47, figs. 6).—The use of polyvalent antistreptococcus serum is considered to be the method of treatment of pneumonia of the horse that gives the best results. The injection of serum is followed by a drop in the temperature which is more marked than that obtained from the administration of antipyretics, particularly acetanilide. The systematic administration of the serum appears to prevent cardiac complications, such as myocarditis, reduces the course of the disease, and hastens convalescence.

A bibliography of four pages is included.

Control measures for internal parasites in horses, M. C. HALL ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul.*, 20 (1927), No. 6, pp. 245-249; also in *Vet. Rec.*, 8 (1928), No. 7, pp. 132-134).—This is an outline of the treatment recommended.

Coccidiosis, J. J. BLACK (*New Jersey Stas. Hints to Poultrymen*, 16 (1928), No. 5, pp. 4, fig. 1).—This is a brief practical account.

Observations on *Davainea proglottina* in the domestic fowl, with a note on *Amoebotaenia sphenoides* v. Linstow, N. BISSET (*Vet. Jour.*, 84 (1928), No. 631, pp. 19-32).—The author describes an outbreak of disease in a flock of fowls due to the combined attacks of the cestode *D. proglottina* and the coccidian *Eimeria avium*. He reports having found the fowl tapeworm *A. sphenoides* in six fowls from various parts of Glamorganshire, in five of which it was associated with *D. proglottina*.

Eye worm of poultry, J. W. FIELDING (*Queensland Agr. Jour.*, 29 (1928), No. 1, pp. 44-49, figs. 4).—The notes here presented relate to the work noted from another source (E. S. R., 56, p. 879).

Immunological and serological studies on the viruses of fowl-pox and vaccinia, G. M. FINDLAY (*Roy. Soc. [London] Proc., Ser. B*, 102 (1928), No. B 718, pp. 354-379).—The author reports upon studies of three strains of fowl-pox virus, two of which are pathogenic for the fowl only, while one is pathogenic for the fowl and the pigeon. All attempts to render these three strains pathogenic for rabbits, rats, calves, and ducks have failed.

"One attack of fowl pox produces immunity. In the fowl any one of the three strains completely immunizes against the others, but in the pigeon previous treatment with the strains pathogenic for the fowl produces only partial immunity against the strain pathogenic for the pigeon and fowl.

"Hyperimmunization with fowl-pox virus produces in the fowl an antiserum containing viricidal antibodies. An antiserum prepared against one of the fowl pathogenic strains destroys the pathogenicity of both the viruses which are pathogenic for the fowl only, but when acting on the virus pathogenic both for fowl and pigeon destroys only its pathogenicity for the fowl.

"Vaccinia virus passaged in the fowl does not become converted into fowl-pox virus and remains pathogenic for the rabbit and rat. Vaccinia virus and fowl-pox virus do not show any cross immunity in the hen. An antivaccinia serum from the hen or rabbit has no viricidal action on the virus of fowl pox, nor has an antifowl-pox serum from the hen any viricidal action on the virus of vaccinia. While fowl-pox virus easily passes through a Berkefeld filter, vaccinia virus even after repeated passage in the hen is still largely held back. No evidence has been obtained to show any close relationship between the virus of vaccinia and the three strains of fowl-pox virus investigated."

Can bacillary white diarrhea be transmitted by droplet infection? R. P. TITTSLER (*Poultry Sci.*, 7 (1928), No. 2, pp. 79-84).—In this general discussion the author first reviews the literature relating to the pathological conditions found in the lungs of infected chicks. He points out that lesions in the lungs of diseased chicks from which *Salmonella pullorum* can be isolated are commonly met with. In reference to the transmission of the organism through the air mention is made of the work of Hinshaw, Upp, and Moore on the transmission in incubators, previously noted (E. S. R., 55, p. 374). The author is inclined to the view that the organism is expelled in the moisture of the breath, and that healthy chicks may contract the disease from inhaling the infected air. It is pointed out that if infected chicks do expel *S. pullorum* from their lungs it may be possible for even a single egg-yolk-infected chick to infect an entire hatch, either before the chicks are taken from the incubator or after they are placed in the brooder.

AGRICULTURAL ENGINEERING

Engineering in agriculture, R. OLNEY (*Engin. News-Rec.*, 100 (1928), No. 2, pp. 58-62, figs. 5).—A sketch is given of the agricultural revolution brought about by farm machinery and the present transformation which power is bringing about, together with a forecast of problems to be solved by agricultural engineers in the future.

Manual of forest engineering and extraction, J. F. STEWART (*London: Chapman & Hall*, 1927, pp. XV+188, pls. [100], figs. [29]).—This manual contains practical information on the subject.

Relation of depth to curvature of channels, H. C. RIFLEY (*Amer. Soc. Civ. Engin. Trans.*, 90 (1927), pp. 207-265, figs. 16).—The object of this paper is to

record the results of investigations into the laws of river hydraulics. As a result two empirical formulas have been devised by means of which the cross profile of a channel may be computed. Some practical applications of these formulas are given which furnish the solution to the problems which heretofore have been considered not susceptible of solution.

Evaporation on United States reclamation projects, I. E. HOUK (*Amer. Soc. Civ. Engin. Trans.*, 90 (1927), pp. 266-378, figs. 26).—In a contribution from the U. S. Bureau of Reclamation a summary is given of the evaporation investigations made on U. S. reclamation projects. The necessity for considering meteorological conditions in applying evaporation data is shown by a diagrammatic comparison of records at the two Yuma stations.

The evaporation from a land pan, 14 in. deep and 3 ft. square, set in the ground with earth banked around the sides, was found to be only 72 per cent of that from a Class A land pan, 10 in. deep and 4 ft. in diameter, set on the ground with no earth around the sides. The evaporation from a land pan on the ground at the edge of an alfalfa field was found to be only 62 per cent of that on a tower 11 ft. above the ground. The evaporation from a floating Class A pan mounted on a raft was 67 per cent of that from a similar pan on land.

Sloshing troubles in floating pans were partly eliminated by installing a sheet-iron honeycomb in the lower part of a pan, thus dividing it into compartments. Measurements of ice evaporation showed daily rates of from 0.01 to 0.07 in., the mean temperatures varying from about 9.6 to 31.1° F.

Residual effects of different irrigation treatments on the crops grown the succeeding year, D. W. ROBERTSON and A. KEZER (*Jour. Amer. Soc. Agron.*, 19 (1927), No. 10, pp. 923-943, figs. 2).—Following experiments at the Colorado Experiment Station to determine the effect of variations in the time and manner of applying irrigation water upon the immediate crop, it was noted in the growing of subsequent crops that residual effects of the previous irrigations appeared. Some of these effects were apparently independent of wide variations in rainfall.

Application of water at heading, blossoming, or filling of the wheat had more influence on the following crop than when the water was applied at the time of germination, at the period of tillering, or where the plats received a distributed irrigation. The distributed irrigation, however, gave the highest yield of both grain and straw, the yields of the two years being considered together. The rainfall during the crop year affected the yield but not the ranking of the different treatments, the succeeding crop grown on plats irrigated at filling having given the highest yield with rainfalls of both 5.64 and 23.26 in.

Public Roads, [February, 1928], (U. S. Dept. Agr., Public Roads, 8 (1928), No. 12, pp. 251-274+[2], figs. 37).—This number of this periodical contains the status of Federal-aid highway construction as of January 31, 1928, together with the following articles: Power-Shovel Operation in Highway Grading, by T. W. Allen and A. P. Anderson (pp. 251-262, 274); and Comparative Tests of Crushed-Stone and Gravel Concrete in New Jersey, by F. H. Jackson (pp. 263-274).

Clays: Their occurrence, properties, and uses, H. RIES (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, 3. ed., rev. and enl., pp. VII+613, figs. 173*).—This book contains chapters on the origin and occurrence of clay; minerals in clay; chemical properties of clay; physical properties of clay; kinds of clays, including bentonite and fuller's earth; distribution of clays in the United States—Alabama to Louisiana, Maine to North Carolina, and North Dakota to Wyoming; and distribution of clays in Canada.

Some of the material contained should be of interest to agricultural engineers engaged in the study of soil dynamics.

Motor-oil characteristics and performance at low temperatures, R. E. WILKIN, P. T. OAK, and D. P. BARNARD, 4TH (S. A. E. [Soc. Automotive Engin.] Jour., 22 (1928), No. 2, pp. 213-220, figs. 12).—The results of an experimental study of the viscosity characteristics of motor oils at low temperatures and their influence upon cranking torque and circulation within the engine are reported. It was found that at temperatures in the neighborhood of 0° F. even oils of asphaltic origin appeared to possess some plastic characteristics, while those of the mixed and paraffin-base types deviated widely from the generally accepted laws of viscous flow. Oils of the latter classes have apparent viscosities which tend to increase with decreasing shearing-stress and to become somewhat greater than might be expected from a study of their characteristics at normal temperatures. It was found, however, that the relatively small temperature-viscosity coefficient of the wax-bearing oils gives them a marked advantage over those of asphaltic origin in cranking, an advantage which becomes greater as the temperature is lowered.

Circulation tests in an engine equipped with a comparatively small mesh screen over the pump intake indicated that circulation was not obtained until the oil in the sump attained its pour-point temperature. The results in general indicate that a low temperature-viscosity coefficient is highly desirable to minimize cranking effort, and that free circulation requires an oil the effective viscosity of which does not increase too rapidly at very low shearing stresses.

Comparison of methods of measuring knock characteristics of fuels, G. EDGAR (S. A. E. [Soc. Automotive Engin.] Jour., 22 (1928), No. 1, pp. 41-48, figs. 4).—It is reported that nine laboratories, employing widely different methods, cooperated in the measurement of the knock characteristics of five selected motor fuels. Considerable divergences are reported in the results obtained by different methods, especially for certain fuels, although there is reasonable agreement for other fuels. Laboratories using the bouncing pin method showed consistent results among themselves. The experimental results are tabulated and are also presented graphically.

From the data presented it appears that considerable divergence is to be expected from the results of different methods of testing fuels even on the specific problem of measuring the quantity of tetraethyl lead needed to equate them. It is also evident that the various scales for rating fuels used at present can not be interpreted readily among different laboratories. It is suggested that rating fuels in terms of two pure hydrocarbons, preferably as nearly alike as possible in their physical properties, should go far in solving this problem. Mixtures of normal heptane and 2,2,4 trimethyl pentane seem ideally suited for this purpose.

So far as the present tests go, the bouncing pin method of determining the equality of knock of two fuels seems to be reasonably satisfactory.

Effect of sulfur in gasoline on wrist-pin corrosion in automobiles, S. H. DIEGS (Indus. and Engin. Chem., 20 (1928), No. 1, pp. 16, 17).—Experiments are reported which showed that when using a gasoline containing 0.04 per cent of sulfur there was no corrosion of wrist pins and other moving parts, and that the water condensed in the crankcase contained no free acid but did contain some ferrous sulfate. When using a gasoline containing 0.151 per cent of sulfur the corrosion was very appreciable, and the water in the crankcase contained free sulfuric acid in small quantities. When using a gasoline containing 0.458 per cent of sulfur the corrosion was very serious and the crankcase water quite acid.

The conclusion is drawn that excessive sulfur in gasoline does cause serious corrosion of moving parts within the crankcase, especially in cold weather and

when frequent stops are made. No evidence was obtained that such corrosion occurs in warm weather or to any great extent on parts that are kept continuously running during the day. There was likewise no evidence to indicate that anything other than sulfur in the gasoline is to blame. Sulfur combined in the lubricant is not at fault except in so far as it may actually be burned in the cylinder. The corrosion is caused in the first place by sulfuric acid, the formation of iron sulfide and oxide being secondary. The amount of corrosion is disproportionately greater for high sulfur than for low sulfur fuels.

Steel for long wearing harrow disks, A. H. HOFFMAN (*Agr. Engin.*, 9 (1928), No. 2, p. 59, figs. 2).—The results of tests of pearlitic manganese steel harrow disks conducted at the California Experiment Station are briefly reported, a comparison being made with ordinary open-hearth carbon steel. The manganese steel contained from 0.85 to 1 per cent of carbon and 0.7 to 1 per cent of manganese. The common disks used were not heat treated, while the manganese disks were heat treated to secure four different degrees of hardness. The tests were conducted along a gravel road. There was no chipping or breaking in any of the edges, but considerable edge deformation occurred in the common crucible steel and a little in the softest of the pearlitic manganese disks. The hardest disks maintained a sharp cutting edge throughout the tests. The amount of wear averaged about 4.5 times as much in the common disks as in the hardest pearlitic manganese.

The effect of some seed treatments on the wear and accuracy of drop of the corn planter, B. KOEHLER and R. I. SHAWL (*Agr. Engin.*, 9 (1928), No. 2, pp. 45, 46, figs. 2).—Studies conducted at the Illinois Experiment Station are reported which showed that the dust treatments used in the experiments apparently do not aggravate the natural wear of the planting mechanism of the corn planter but rather have a lubricating effect on these parts. These same dust treatments, however, were found to decrease the accuracy of drop.

Corn borer control by mechanical means, C. O. REED (*Agr. Engin.*, 9 (1928), No. 2, pp. 37-44, figs. 7).—In this contribution from the Ohio State University, a summary is given of the activities undertaken by the U. S. Department of Agriculture and the university in connection with the mechanical control of the European corn borer during 1927.

The conclusion is drawn that the mechanical destruction of the larvae from harvest time till the following June is the only means of control yet known which can be applied generally and in a large way. Cutting corn within 2 in. of the ground surface is of great importance to the farmer who is not going to plow, and should be emphasized even to the farmer who does plow. It has been found that to properly clean a badly infested field after the stalks have been raked and burned is almost impossible with present equipment. Burning, when properly done, is considered the surest method of control.

Harvesting grain with the combined harvester-thresher in northwest Texas, H. P. SMITH and R. F. SPILMAN (*Texas Sta. Bul.* 373 (1927), pp. 24, figs. 7).—Studies conducted in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Public Roads are reported.

An analysis of 72 records secured from wheat growers in northwest Texas who used combines in 1926 showed that the cost of harvesting is lowered, the amount of labor required is reduced, and the period of harvesting and threshing is shortened by the use of the combine. The cost of harvesting and threshing with the combine ranged from \$1.42 to \$2.06 per acre and from 5 to 13 cts. per bushel. The number of hours of labor per acre required for harvesting and threshing where the wheat was bound or headed and threshed with the stationary thresher was 4.6 when the binder was used, 3.8 when the header was used, and only 0.75 when the combine was used.

The most common sizes of combines used ranged from 12 to 16 ft. and were of the engine type. The number of acres harvested per day varied from 15.6 for the 8-ft. power take-off to 53 for the 20-ft. auxiliary engine type.

Desiccation of sugar beet and the extraction of sugar, B. J. OWEN (*London: Min. Agr. and Fisheries, 1927, pp. 84, pls. [23], figs. [19]*).—Studies are reported which showed that the desiccation of sugar beets is analogous to the desiccation of other crops, with modifications resulting from the nature of the raw material and the object of drying which has the preservation of one constituent as its sole aim. It has been found that dehydration of organic vegetable substances or products in masses of relatively small thicknesses can be successfully obtained by means of an appropriately balanced process, which is based upon certain specific factors primarily dependent upon the composition and properties of the beet. These factors are consolidation, volume of air, pressure of air, time of treatment, thickness of material, and temperature of the air at varying moisture ranges.

The data show that influences occur analogous to those which have been ascertained and determined by experiment in the drying of other crops. The laws governing the process show that sugar beet in a moist state should, in order to avoid caramelization and inversion, not be heated to a temperature exceeding 220° F. The drying operation must be accelerated as much as possible without raising the temperature of the beet above the critical temperature. Satisfactory results were obtained by extending the treatment over a period of time not exceeding 1 hour. It was also found that such quantity or weight of beet cossettes as is usually subjected to treatment can be economically dried in the course of 45 minutes.

As regards porosity or penetrability, the natural resistance offered by the cossettes to the passage of the heated air is materially affected during the course of the drying operation by shrinkage, which amounts to about 50 per cent, while the resistance during drying decreases gradually with the reduction of moisture content to approximately 25 per cent of the original resistance. The porosity or penetrability of the material can be further increased, with a corresponding reduction in the time of treatment, by slicing or cutting the beets into thin ridge-tile shaped cossettes, the surface of the material exposed to the air per unit weight being thus increased to the greatest possible extent.

When the beet is dried at rest, whether in the form of a column or bed, and air is passed continuously through the depth or thickness of the entire mass, drying has been found to be effected to the best advantage and with the greatest economy by passing the air at a supply temperature ranging from 180 to 212° through a depth or thickness of material of from 8 to 12 in. It is thus possible to discharge the air from the material in a state of saturation at an exit temperature of from 80 to 90° during a period of time ranging from one-half to two-thirds of the total duration of the process. The material can be dried in not much more than 1 hour to a moisture content of from 5 to 10 per cent. These conditions can be obtained by employing a volume of air saturated at a temperature before heating of from 50 to 60° at the rate of from 1,200 to 1,400 lbs. of air per minute per ton of beet, with a velocity of air of from 230 to 280 ft. per minute at an initial pressure ranging from 1.5 to 2.5 in. Owing to the shrinkage of the material and to changes in porosity during drying the initial pressure can be gradually reduced to from 0.4 to 0.7 in.

When the beet is treated in continuous or intermittent motion and the air is passed at intervals through it so that the material is progressively dried, the respective supply temperatures of the air for each passage through the material should not much exceed 212° for the first passage, 230° for the intermediate passage, and 260° for the last passage. Where the respective supply tempera-

tures of the air are graduated for each passage according to the progressive decrease of moisture content, the most satisfactory results have been obtained by using supply temperatures which are graduated from 190 to 220° for the first passage, from 220 to 250° for the intermediate passage, and from 250 to 320° for the last passage. Whether the temperature be constant or graduated, the drying is effected by massing or piling the fresh material to a depth or thickness ranging from 5 to 9 in., it thus being possible to discharge the air from the fresh material in a state of constant saturation at an exit temperature of from 110 to 120° and to remove from 50 to 60 per cent of the total moisture present in from 15 to 20 minutes.

It was found that the beet during drying is subject to chemical and physical changes of a delicate character. For practical drying within such limits, it would appear necessary, therefore, to use a system of drying in the mass which will afford not only a precise mechanical control but also utilize the physiological processes which occur in the drying and so protect the sucrose in the beet.

Sections are included on extraction, sugar production, and purification, together with appendixes on cell rupture, the effect of drying upon the nitrogenous substances in sugar beet, treatment of effluents, and control measures. No confirmation could be obtained of a hypothesis that a two-stage drying process is necessary for the drying of beet.

The Northwest Station poultry house, A. M. PILKEY and A. M. FOKER (*Minnesota Sta., Crookston Substa. Rpt. 1926, pp. 59-63, figs. 4*).—Specifications and a bill of material for this poultry house are given.

Municipal and rural sanitation, V. M. EHLERS and E. W. STEEL (*New York and London: McGraw-Hill Book Co., 1927, pp. XI+448, figs. 119*).—This book appears to summarize experience by the Agricultural and Mechanical College of Texas and the State Health Department of Texas. It is pointed out that municipal and rural sanitation now includes, in addition to residential sewage disposal and water supplies, such matters as the sanitation of milk and other foods, refuse collection and disposal, the control of mosquitoes, flies, and rodents, and plumbing inspection and housing. Chapters are included on communicable diseases, principles of excreta disposal, excreta disposal without water carriage, excreta disposal with water carriage, general characteristics of water, treatment of water, protection of water supplies, refuse collection, refuse disposal, mosquito characteristics, mosquito control methods, organization of antimosquito campaigns, fly control, rodent control, milk sanitation, food sanitation, plumbing, ventilation, light, housing, school sanitation, industrial hygiene, tourist camps, swimming pool sanitation, miscellaneous, disinfection, vital statistics, and public health organizations. Appendixes on sanitation measures and considerable tabular data are also included.

RURAL ECONOMICS AND SOCIOLOGY

The agricultural problem in the United States (*New York: Natl. Indus. Conf. Bd., Inc., 1926, pp. XIV+157, figs. 16*).—This is the report on an investigation conducted by the National Industrial Conference Board of the main features of the agricultural problem in the United States.

The agricultural "plant," the natural forces, population, tenure, nativity, number and size of enterprises, capital, branches of production, and other aspects of agriculture are discussed; and also the economic position of the industry, including the pre-war, war, and post-war acreages, production, consumption, exports, income, return for capital and labor, prices, etc. Wages, fixed charges, operating expenses, and other factors in agricultural costs; and produc-

tion, demand, sales, markets, prices, and other factors in agricultural income are analyzed.

The analysis strongly suggests that the agricultural problems are of long standing and affect the industry as a whole, and that they can not be remedied by extemporized legislation to meet the demands of special sections of the country or branches of the industry but only by cooperation of all economic interests of the country along sound economic lines.

The condition of agriculture in the United States and measures for its improvement (*New York: Natl. Indus. Conf. Bd., Inc.; Washington: Chamber Com. U. S. A., 1927, pp. XII+273, figs. 8*).—This is a report of the Business Men's Commission on Agriculture organized by the National Industrial Conference Board, Inc., and the Chamber of Commerce of the United States. It is based upon hearings held in ten cities from December 20, 1926, to April 20, 1927, at which 170 witnesses from 34 States and the District of Columbia were heard. The present status and trend of agricultural conditions, the factors making for the present agricultural depression, the nature of the agricultural problem, and the measures for agricultural improvement are discussed.

The chief causes for the recent agricultural depression, other than post-war deflation, were found to be that (1) certain major elements or factors in agricultural costs, such as taxes, interest rates, and transportation costs, have resisted readjustment and continued at relatively high levels; (2) immigration restriction, the shifting of the United States from a debtor to a creditor nation, the extension of tariff protection to manufacturing industry, and other national policies and changes in the international trade relations have tended to increase production costs and to restrict the market for American farm products; and (3) the decline in per capita consumption of certain foods, the substitution of mechanical for animal power, uneconomic expansion of production, and other factors covering a longer period have combined to reduce domestic consumption.

The following suggestions for improving the condition of agriculture are made: (1) A careful reconsideration of the tariff policies of the United States with a view to equalizing their effects as between agriculture and manufacturing industries; (2) the organization of stabilizing corporations to bring about stabilization of prices and production in agriculture and the extension of markets; (3) the reduction of production costs by the use of better technical and economic methods; (4) increased organized cooperation of farmers in purchasing and marketing; (5) a carefully planned policy for land utilization; (6) earnest and effective cooperation of farmers and other economic groups in controlling local and State expenditures and in making redistribution of tax burdens; (7) the improvement of the machinery of agricultural credit; (8) readjustment of railroad rates, extension of waterway systems, and reduction in distribution costs; and (9) the extension and coordination of agricultural research by the Federal and State Governments.

The share of agriculture in the national income—revised and new figures for 1925 and 1926, H. C. TAYLOR and J. PERLMAN (*Jour. Land and Pub. Utility Econ.*, 3 (1927), No. 4, pp. 432, 433).—Revised and new figures for 1925 and 1926 are given for the article previously noted (*E. S. R.*, 57, p. 679).

The agricultural outlook for Utah, 1928, compiled by P. V. CARDON and W. P. THOMAS (*Utah Sta. Circ.* 70 (1928), pp. 16).—This circular contains an analysis of the agricultural outlook for Utah, based upon the national analysis previously noted (*E. S. R.*, 58, p. 782).

[Papers presented at the eighteenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ.*, 10 (1928), No. 1, pp. 136,

figs. 4).—The following papers, read at the meeting in Washington, D. C., December 28-30, 1927, are included: Which Does Agriculture Need—Readjustment or Legislation? by G. F. Warren (pp. 1-15); Which Does Agriculture Need—Readjustment or Legislation? The Case for Legislation, by G. S. Wehrwein, with discussions by J. S. Davis and C. L. Stewart (pp. 16-32); Research in Agricultural Economics, by H. C. Taylor (pp. 33-41); Research in Prices of Farm Products, by J. D. Black, with discussion by O. C. Stine (pp. 42-70); and Research in Agricultural Income, by J. I. Falconer, with discussion by L. H. Bean (pp. 71-83); and a discussion of The Land Grant College Report (E. S. R., 58, p. 3), by H. R. Tolley, B. H. Hibbard, E. H. Thomson, and T. Macklin (pp. 84-105). The meeting has been discussed editorially together with reports of various committees of the association (E. S. R., 58, p. 301).

The Federal subsidy in land reclamation, R. P. TEELE (*Jour. Land and Pub. Utility Econ.*, 3 (1927), No. 4, pp. 337-342).—The subsidy being given settlers in United States reclamation enterprises by reason of the fact that no interest is charged on deferred payments of construction charges is shown to amount to 163 per cent of the average announced charge, assuming a 6 per cent interest charge. The author states that "this is not a subsidy to agriculture generally or even to irrigated agriculture generally, . . . but to the individuals who are farming those particular lands, and in so far as it affects agriculture generally it depresses agriculture by adding to the volume of production without a corresponding increase in demand." At the rate of increase in the area irrigated between 1909 and 1919, the area for which water was ready in 1920 and the area included in enterprises in excess of that irrigated in 1919 will take care of the increase for 14 and 35 years, respectively.

[Papers on irrigation presented at the summer meeting, 1925, of the American Society of Civil Engineers] (*Amer. Soc. Civ. Engin. Trans.*, 90 (1927), pp. 680-790, 1035-1093, *figs. 5*).—The following papers were presented at the meeting held at Salt Lake City in July, 1925:

History and Problems of Irrigation Development in the West, by J. A. Widtsoe (pp. 680-686); The Financing of Irrigation Developments by Private Capital, by R. E. Shepherd (pp. 710-717); Present Policy of the United States Bureau of Reclamation regarding Land Settlement, by E. Mead (p. 730-734); Land Settlement of Irrigation Projects, by A. Griffin (pp. 750-756); Irrigation Development through Irrigation Districts, by E. C. Eaton and F. Adams (pp. 773-783, 788-790); Interstate Water Problems and Their Solution, by M. C. Hinderlider and R. I. Meeker (pp. 1035-1051, 1065-1073); and the report of the duty of water committee on the Determination of the Duty of Water in Water-right Adjudications, by S. T. Harding et al. (pp. 1074-1090).

The papers are each discussed by one or more of the following men: S. Fortier, A. P. Davis, C. E. Grunsky, F. H. Newell, J. E. Field, E. Mead, B. A. Etcheverry, T. H. Means, G. C. Kreutzer, O. L. Waller, W. G. Swendsen, C. H. West, R. A. Hart, R. K. Tiffany, W. E. Packard, R. R. Lyman, J. B. Lippincott, O. V. P. Stout, F. C. Emerson, D. C. Henny, E. A. Porter, and L. Garrison.

Higher farming, G. FRECHEVILLE (*Jour. Roy. Agr. Soc. England*, 87 (1926), pp. 86-103, *fig. 1*).—Data obtained by various experiment stations in the British Empire and the United States on the application of manure and fertilizers, more frequent cultivations, heavier irrigation, denser seeding, and higher feeding of stock are analyzed, with a view to determining whether such practices are a remedy for lower prices of agricultural products.

The conclusion of the author is that "in a period of low prices and uncertain outlook the moral is to farm more extensively, and the advice of Sir John Lawes^{*} is as sound to-day as it was fifty years ago [1879]."

Are peasant enterprises capitalistic undertakings? [trans. title], S. von FRAUENDORFER (*Landw. Jahrb. Bayern*, 17 (1927), No. 3-4, pp. 164-173).—The question is discussed and the conclusion reached that such enterprises have not been and are not at present capitalistic.

Rents and prices of agricultural land in South Wales, 1915-1925, A. W. ASHBY and J. P. HOWELL (*Welsh Jour. Agr.*, 3 (1927), pp. 5-23, fig. 1).—An analysis is made of the rents received and sales prices of a number of farms and the number of years' rent required to equal the sales price determined.

Locality, size of farm, and period of sale were found to be the chief determinants of value. The size of holding was the chief factor, 28 years' rent being required to equal the purchase price of farms of from 1 to 50 acres, 26.2 years for farms of from 50 to 150 acres, and 24.4 years for farms over 150 acres. The period of sale had much less influence than generally expected. Without a future rise in land values, tenants were found to be in a more favorable position than persons who had purchased during the period.

Classification of land for taxation, J. V. VAN SICKLE (*Quart. Jour. Econ.*, 42 (1927), No. 1, pp. 94-116).—The European cadastral method of taxing land, with certain modifications, is proposed for use in the United States.

Report of Royal Commission on Rural Credits, J. J. ESSON, P. H. COX, and W. J. POLSON (*Wellington, N. Z.: Govt.*, 1926, pp. IV+84).—This is the report of the Royal Commission on Rural Credits, appointed by the Governor General of New Zealand on August 28, 1925, to inquire into and report on the financial assistance afforded to farmers, the legislation in force, and the methods and means adopted by the States of Europe, Egypt, and America to raise money and afford assistance, the results and comparative advantages of the different systems, and the advisability of New Zealand's adopting one or more of the systems.

Land credit in the town of Newton, Manitowoc County, Wisconsin, 1848-1926, D. ROZMAN (*Jour. Land and Pub. Utility Econ.*, 3 (1927), No. 4, pp. 371-384, figs. 7).—This is a study of farm credit during the period 1848-1926 in a stable, more or less homogeneous community in which 85 per cent of all loans have been made by actual residents of the county.

The control of credit, A. W. ASHBY and J. M. JONES (*Univ. Col. Wales, Aberystwyth, Agr. Econ. Dept., Coop. and Marketing*, No. 2 (1927), pp. 13).—The general methods of control or curtailment of credit used by the Wales cooperative societies are discussed.

Contemporary agricultural law, A. J. SPENCER (*Jour. Roy. Agr. Soc. England*, 87 (1926), pp. 177-191).—The acts affecting agricultural interests passed by Parliament in 1926, and court decisions affecting agricultural labor, landlord and tenant, stock and crops, taxes, and other subjects pertaining to agriculture are reviewed.

The relation of prices to production of pigs, A. W. ASHBY and J. M. JONES (*Jour. Roy. Agr. Soc. England*, 87 (1926), pp. 67-86, figs. 4).—A study is made of the production, imports, consumption, prices, and purchasing power of hogs and pork products in the United Kingdom.

The poultry industry: A selected list of references on the economic aspects of the industry, 1920-1927, compiled by L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 24 (1928), pp. IV+106).—This is a selected list of books, bulletins, and pamphlets on the economic aspects of the

^{*} Is Higher Farming a Remedy for Lower Prices? Rothamsted Mem. Agr. Chem. and Physiol., 5 (1875-1883), [No.] 8.

poultry industry, 1920-1927, primarily in the United States and Canada, but with same references to the industry in foreign countries.

Report on the dried fruits industry of Australia, H. W. GEPP ET AL. (*Melbourne: Develpmt. and Migration Comm., 1927, pp. 55, pls. 8*).—This is a report of the Development and Migration Commission covering the world position of the industry, the production, trade, packing, marketing and selling, financing, cost of production, and other phases of the industry in Australia.

An economic study of the Columbia farm trade area, T. D. JOHNSON, F. H. ROBINSON, B. A. RUSSELL, and W. C. JENSEN (*South Carolina Sta. Bul. 243 (1927), pp. 64, figs. 6*).—The results are presented of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, as to Richland, Lexington, Saluda, Calhoun, Fairfield, and Kershaw Counties, S. C. An analysis is made of the local production and imports of meats, poultry and dairy products, vegetables, cotton, and grains, and of the organization, cash receipts, cash expenditures, and investment and net income of cotton, truck, poultry, cattle, and diversified farms in the area.

Commercial survey of the Southeast, J. M. HAGER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Dom. Com. Ser. 19 (1927), pp. VII+477, pl. 1, figs. 30*).—The major factors underlying distribution in North Carolina, South Carolina, Georgia, Alabama, Florida, and eastern Tennessee are analyzed, and the fundamental economic conditions, with particular reference to the marketing of products, are presented. Special consideration is given to the geographic basis of commerce, the natural resources, and the industries of the area. Density and distribution of population, occupations, income, education, habits, and traditions are studied. Commodity movements, sales problems, indexes of income, and consumption are considered in their relation to the prevalence of hand labor in agriculture, the mild climate, the scarcity of large cities, the rural isolation, and other factors.

Producing and marketing farm produce in northern New Castle County, R. O. BAUSMAN (*Del. Univ. Agr. Ext. Bul. 13 (1927), pp. 90, figs. 23*).—This bulletin is based upon a farm business survey including records of 92 farms in northern New Castle County for the year 1925, conducted by the Extension Service of the University of Delaware in cooperation with the Bureau of Agricultural Economics, U. S. D. A. The financial organization of the farms, the factors influencing success, the different farm enterprises, and marketing are described and discussed.

The market for Pennsylvania fruit, D. M. JAMES and H. F. McFEELY (*Penn. Dept. Agr. Bul. 446 (1927), pp. 35, figs. 27*).—Statistics regarding the source and seasonal distribution of the supply and the Pennsylvania production and shipments of apples, peaches, and grapes are given and discussed.

The marketing of live-stock, F. J. PREWETT (*Jour. Roy. Agr. Soc. England, 87 (1926), pp. 57-67*).—The present types and methods of marketing in England and the British Isles are discussed and recommendations made.

Crops and Markets, [February, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 2, pp. 33-72, figs. 2*).—Besides tables, notes, graphs, reports, and summaries of the usual types, the following are included: Summary of the agricultural outlook for 1928, previously noted (*E. S. R., 53, p. 782*); the crop and livestock report dates of the Department for 1928; tables showing the number and value of livestock on farms, January 1, 1926-1928, by States, and summaries; the value per head, by age groups, in past years; the average monthly farm prices of animals, poultry, and their products since 1910; and the number of heifers kept for milch cows; also tables showing the disposition of the 1927 potato crop and merchantable stocks on January 1, 1928.

Joint use of a sales organization by two cooperative associations, K. B. GARDNER (*U. S. Dept. Agr. Circ. 10* (1927), pp. 32, figs. 9).—This is a study of the operation of the joint-selling arrangement between the California Fruit Growers Exchange and the California Fruit Exchange, by which deciduous fruit of the latter is sold through the citrus fruit sales organization of the former.

The farmer's interest in European trade relations, E. G. NOURSE (*Acad. Polit. Sci. New York, Proc.*, 12 (1928), No. 4, pp. 116-123).—A discussion of the changes in the exports of agricultural products of the United States and the future possibilities for such exports.

Denmark and rural China, J. B. TAYLER (*Chinese Social and Polit. Sci. Rev.*, 12 (1928), No. 1, pp. 116-129).—The means by which the high development of agricultural cooperation was achieved in Denmark are described, and their applicability to the reconstruction of village life in China is discussed.

Agricultural co-operation in South Wales: An economic and financial analysis, J. M. JONES (*Univ. Col. Wales, Aberystwyth, Agr. Econ. Dept., Coop. and Marketing, No. 1* (1927), pp. 40, fig. 1).—This is an economic and financial analysis of the membership, types of business, financing, management, operation, earnings, etc., of 48 cooperative associations operating in the 7 South Wales counties.

Problems of the world's food supply, R. D. WATT (*Australasian Assoc. Adv. Sci. Rpt.*, 17 (1924), pp. 644-661).—A discussion of the future needs and possible food supply, especially wheat.

Drift of population to the cities, E. T. MCPHEE (*Australasian Assoc. Adv. Sci. Rpt.*, 17 (1924), pp. 535-550).—The movement of population to the cities in different countries, and the causes and effects upon social welfare of such movement, are discussed.

Research in the humanistic and social sciences, F. A. OGG (*New York and London: Century Co.*, 1928, pp. VIII+454).—This is a report of a survey of research in the United States in history, economics, political science, sociology, philosophy, philology, and archaeology, conducted for the American Council of Learned Societies. The data were obtained by correspondence, interviews, and conferences, from printed and typewritten sources, and from answers to questionnaires sent to some 16,000 individual members of societies affiliated in the American Council of Learned Societies, to practically all colleges and universities included in the Accepted List of Colleges and Universities Approved by the Association of American Universities, to approximately 275 nonacademic organizations doing, or purporting to be doing, research or fostering such work, and to upwards of 300 libraries of different kinds.

The report covers the research interests, agencies, activities, and programs of national and local learned societies; the status of universities as research centers; the position of research in the college, as distinguished from the university; the origins, growth, resources, equipment, interests, present undertakings, and contemplated activities of institutes, bureaus, foundations, and other organizations specially designed to carry on research work; the research interests, facilities, and activities of social, philanthropic, reform, and other sorts of committees, societies, and federations; the research projects and programs of business concerns, financial institutions, and commercial and industrial organizations; the research work of the National Government; the research work being done or planned by individual scholars, working privately; the stage or status at which research has arrived in each of the seven branches of learning covered; the modes and amounts of assistance given research work; the fellowships, prizes, grants, and other pecuniary assistance to research; libraries as

depositories of research materials; and the problem of adequate provision for prompt and suitable publication of the results of research work.

Agricultural statistics, 1926, R. E. STANLEY (*Jour. Roy. Agr. Soc. England*, 87 (1926), pp. 191-211).—Statistics for 1926, compiled by the Ministry of Agriculture and Fisheries, are presented.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A study of the professional training of teachers of vocational agriculture, E. L. HOLTON (*Fed. Bd. Vocat. Ed. Bul. 122* (1927), pp. VII+64, figs. 5).—This bulletin is based upon replies from 663 teachers of vocational agriculture throughout the United States to a questionnaire covering their training and experience and the activities such teachers should try to teach students. The data are tabulated and analyzed in chapters covering the training and experience of teachers, State requirements in education and psychology, rank-values of professional teacher-training courses, and an activity analysis of teaching vocational agriculture. Conclusions are drawn and recommendations made.

Source material for the use of rural parent-teacher association units (*Washington, D. C.: Natl. Cong. Parents and Teachers*, 1927, pp. 46).—Included are the following articles, with lists of books, bulletins, other publications, and motion-picture films: The Responsibility of Parents for the Health of the Preschool Child, by B. M. Haines (pp. 8-12); The Responsibility of Parents and Teachers for the Health of the Preschool Child, by J. F. Rogers (pp. 13-16); Training for Everyday Life, by L. R. Alderman (pp. 17-22); What Parents Should Know about Their Schools, by K. Cook (pp. 23-27); Leisure and How to Use It, by R. G. Foster (pp. 28-38); Wholesome Living in the Home, by B. R. Andrews (pp. 39-44); and How the Parent-Teacher Associations Can Contribute toward the Improvement of Teaching in the Rural Schools, by A. S. Baylor (pp. 44-46).

Plant and equipment for vocational classes in home economics (*Fed. Bd. Vocat. Ed. Bul. 124* (1927), pp. IX+123, figs. 80).—This bulletin discusses the needs and aims in equipping for home economics instruction in vocational schools, the location and layouts of the home economics departments of such schools, the standards for the home economics plant and equipment, and equipment for the individual laboratories. A number of equipment problems with suggested solutions are included.

Ten years of agronomy extension, 1915 to 1924, O. S. FISHER (*U. S. Dept. Agr. Circ. 22* (1928), pp. 24, figs. 8).—Extension activities in agronomy are reviewed for the period indicated.

FOODS—HUMAN NUTRITION

The standardization of oil for mayonnaise, R. U. NORRIS (*Oil and Fat Indus.*, 4 (1927), No. 11, pp. 397-399).—A discussion of the essential qualities of oils for successful mayonnaise manufacture, with a statement of standards and specifications for such oils as adopted by the mayonnaise manufacturing company of which the author is chemist.

A study of the nitrogen minimum.—The effect of sixty-three days of a protein-free diet on the nitrogen partition products in the urine and on the heat production, H. J. DEUEL, JR., I. and K. SANDIFORD, and W. M. BOOTHBY (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 391-406).—In this investigation the method of studying deposit protein consisted in reducing the urinary nitrogen excretion to a minimum by prolonged subsistence on a diet with negligible

protein content and then administering thyroxin to bring about a further destruction of the deposit protein. The experiment, which was conducted on the senior author, lasted continuously for 81 days, divided into a period of 30 days on the nitrogen-free diet, 13 days on the same diet with intravenous injection of 7 mg. daily of thyroxin, 11 days on the same diet without the thyroxin, 8 days on a diet containing from 30 to 68 gm. of protein, 9 days on the protein-free diet, 3 days on a diet containing 19.2 gm. of protein, 3 days on one containing 59.2 gm. of protein, and 4 days on one containing 225 gm. of protein. A final period of 2 days was included after the subject had returned to a normal but unknown high protein diet. The data obtained before and after the administration of the thyroxin are reported and discussed in this paper, and those of the thyroxin period in the following paper.

The minimal excretion of total nitrogen in the urine during the first period was 2.1 gm. in 24 hours, and that of the last 2 days of the period directly after the thyroxin administration 1.79 and 1.75 gm., the final value being slightly lower than any on record. It is estimated that the amount of deposit nitrogen lost from the body in both urine and feces was approximately 291 gm., equivalent to 1.8 kg. of protein (dry), or about 12 kg. including its normal complement of water. This amount, which was very close to the loss in weight, 11.3 kg., was about 16 per cent of the original body weight. The authors are of the opinion that in spite of this extensive loss the deposit protein was by no means exhausted, and that the reduction of urinary nitrogen to small quantities does not necessarily mean that the body can not continue to maintain itself for a further period on a nitrogen-free diet.

During the period in which the total urinary nitrogen varied from 10 to 1.75 gm. daily, the output of creatinine, uric acid, and amino acid and undetermined nitrogen was quite constant, the fluctuations in total nitrogen being almost entirely due to variations in the amount of urea excreted.

The basal metabolic rate was -9 per cent (Du Bois standards) on the second day of the nonprotein diet, and then fell quite rapidly to -20 per cent, at which level it remained practically constant throughout the protein-free period. In the final period of increasing protein intake, a change from -12 to +9 per cent took place.

The effect of thyroxin on the respiratory and nitrogen metabolism of a normal subject following prolonged nitrogen-free diet, H. J. DEUEL, JR., I. and K. SANDIFORD, and W. M. BOOTHBY (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 407-414).—The data reported in this paper cover the period of thyroxin administration in the metabolism study noted above.

The characteristic effect of thyroxin on nitrogenous and respiratory metabolism, an increase in nitrogen elimination as urea coincident with a rising thyroxin concentration in the tissues, as evidenced by an increasing basal metabolic rate, was not altered by the reduction of the deposit protein brought about by the 30-day period on the nonprotein diet.

Growth upon diets practically devoid of arginine, with some observations upon the relation of glutamic and aspartic acids to nutrition, W. E. BUNNEY and W. C. ROSE (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 521-534, figs. 5).—Using the Kossel-Staudt flavianic acid method of precipitating arginine,⁴ the authors have been able to prepare arginine-free diets and have studied their adequacy for maintenance and growth by the methods employed in previous studies from this laboratory (E. S. R., 57, p. 194).

When the arginine-free amino acid mixture composed 12 per cent of the ration, rats grew at practically normal rate during the experimental period of 100 days. When the level was reduced to 9 per cent growth was about half the

⁴ Hoppe-Seyler's Ztschr. Physiol. Chem., 156 (1926), No. 4-6, pp. 270-274.

normal rate, but growth was not accelerated by the addition of arginine, thus indicating that arginine was not the limiting factor and that it is not an essential amino acid.

Equally good results were obtained on diets not only devoid of arginine but low in aspartic and glutamic acids, but it is thought that the evidence is still insufficient to draw definite conclusions concerning the dispensability or indispensability of these dibasic amino acids.

Studies on the fixation of calcium [trans. title], G. MOURIQUAND, A. LEULIER, M. BERNHEIM, and J. SCHOEN (*Presse Méd. [Paris]*, 36 (1928), No. 14, pp. 209-213, figs. 5).—Evidence is submitted in the form of Röntgenograms and data on the ash and phosphorus pentoxide content of the diaphyses and epiphyses of the bones of rats under varying treatments, showing that adrenalin, parathyroid and thyroid extracts, and treatment with infra red rays are without effect in preventing rickets on the McCollum low phosphorus rachitic diet, but that cod-liver oil, ultra-violet light, and irradiated dried milk have a marked antirachitic effect. The value of irradiated milk is emphasized particularly, and it is suggested that it may be of value not only in the prevention and cure of human rickets, but in the treatment of tuberculosis.

Vitamin synthesis in plants as affected by light source, V. G. HELLER (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 499-511, figs. 2).—In this attempt to determine the effect of different sources of light upon the synthesis of vitamins A, B, and C, the general plan was to compare the effect when fed as the sole source of the vitamin in question of a definite number of seeds (wheat or maize) ungerminated and grown for definite periods of time in the dark and exposed to the light from a Mazda lamp, an ultra-violet lamp, and strong sunlight.

As judged by the data presented, the effect of light was greater in the development of vitamin A than of the other two vitamins. In view of the conflicting evidence concerning the formation of vitamin A in elolated seedlings, it is of interest that evidence was obtained of a slight increase in such seedlings. The quantity of vitamin A synthesized is judged to be dependent upon the intensity of illumination, the time of exposure, and the relative amount of shorter wave lengths, and to follow closely the rate of growth of the plant.

There was no evidence of an increase in vitamin B in the germination and early growth of the seedlings.

There was a greater increase of vitamin C than either of the other vitamins, and some evidence that the increase was greater in the seeds germinated in the light than in the dark.

The physiological rôle of vitamin B.—Part V, The relation of inanition to vitamin B deficiency in pigeons, G. F. MARRIAN, L. C. BAKER, J. C. DRUMMOND, and H. WOOLLARD (*Biochem. Jour.* 21 (1927), No. 6, pp. 1336-1348, figs. 2).—The studies reported in this paper were undertaken to throw light on two points not made clear in the earlier studies of the series (*E. S. R.*, 58, p. 193)—whether or not the nervous manifestations and the hypertrophy of the adrenal glands noted in rats and pigeons in vitamin B deficiency can, like the other symptoms, be traced to inanition alone.

Two series of experiments were conducted. In the first four groups of pigeons were subjected to starvation, but with ample supplies of water. Two groups received daily from 100 to 200 cc. of water introduced into the crop. One of these groups and one of the other were forcibly fed 10 cc. of an aqueous 10 per cent yeast extract (marmite). In the second experiment, three groups of pigeons were fed a vitamin B-deficient diet of the type used by Randoin and Simonnet (*E. S. R.*, 52, p. 863). One group was allowed to feed voluntarily on the deficient diet, another was forcibly fed about 20 gm. daily, and a third was

forcibly fed 15 gm. and given in addition 1 gm. daily of yeast extract. All of the birds were starved for 24 hours before the initial weights were recorded.

In the starving pigeons the losses in body weight and the temperature changes were of the same order in all four groups. In the pigeons on the second diet, the group allowed to take the deficient food voluntarily ate normally and maintained weight for about a week, following which there was a progressive decrease in food intake and a corresponding decrease in weight. Most, but not all of the birds, developed beriberi symptoms in about 30 days. The forcibly-fed pigeons showed convulsive symptoms in less than 20 days, at a time when the reduction of body weight was almost negligible and when the blood sugar was above normal.

The adrenals of the pigeons in all the groups except the one forcibly fed the deficient diet plus an extract of yeast were hypertrophied. The hypertrophy of the adrenals of starving pigeons receiving ample supplies of vitamin B is contrary to the results reported by Beznák (E. S. R., 50, p. 859). In most cases the adrenalin content of the glands of the starving pigeons, whether receiving vitamin B or not, was increased proportionately to the hypertrophy, thus confirming the conclusion of McCarrison (E. S. R., 41, p. 264) that the hypertrophy is medullary. The adrenals of the forcibly-fed pigeons were hypertrophied to a considerable extent, although no corresponding increases in adrenalin content were noted.

In discussing these observations a view often expressed in the literature on beriberi is again suggested, that "the underlying cause of the convulsions is a toxic substance, of which either the production is suppressed or the poisonous action is neutralized when vitamin B is administered."

Studies on the antineuritic vitamin.—I, Preliminary note on a possible second factor, J. L. ROSEDALE (*Biochem. Jour.*, 21 (1927), No. 6, pp. 1266, 1267).—The evidence upon which the author draws the conclusion that "two factors are concerned in the ordinary rôle of vitamin B" is briefly as follows:

A 1 per cent acetic acid extract of rice polishings concentrated in vacuo at 40° C. until 1 cc. corresponded to 1 gm. of the original polishings cured active polyneuritis in pigeons in a 5-cc. dosage, and in 2-cc. daily doses promoted growth and well-being in young pigeons on a polished rice diet. On precipitating the extract with lead acetate and removing traces of lead from both precipitate and filtrate, the filtrate behaved like the original extract, while the precipitate promoted growth but did not cure typical polyneuritis. The fraction precipitated by lead acetate is considered to be concerned with the digestive processes.

On the existence of two active factors in the vitamin B complex, II, W. D. SALMON, N. B. GUERRANT, and I. M. HAYS (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 487-497, figs. 2).—In continuation of the investigation previously noted (E. S. R., 57, p. 594), further data are reported on the relative adsorption of the B-P factor (vitamin F) and the P-P factor (vitamin G) by fuller's earth, the purification of the vitamin G fraction, and the retardation of growth by an insufficiency of vitamin F.

By passing an acidulated aqueous extract of velvet bean leaves through a supercentrifuge and treating the extract with 10 gm. of fuller's earth per kilogram of the dried leaves a preparation was obtained which prevented beriberi in pigeons in daily doses of 0.01 gm., but did not promote growth in rats in doses as high as 0.1 gm. daily. It is estimated that more than one-third of the vitamin F fraction was adsorbed by the fuller's earth, while only a negligible amount of vitamin G was thus adsorbed.

To obtain a concentrate of vitamin G, the filtrate from the fuller's earth after the adsorption of vitamin F was concentrated by vacuum distillation to

a volume of 2 liters for each kilogram of leaves used and then treated with two successive 30-gm. portions of fuller's earth. Each portion of fuller's earth was removed by a supercentrifuge and washed with water and alcohol, the centrifugate and washings were combined and again concentrated to 2 liters per kilogram of dry leaves, and 2 liters of the concentrated solution were then poured into 3 liters of 93 per cent alcohol according to the method of Osborne and Wakeman (*E. S. R.*, 42, p. 814). After washing with 51 per cent alcohol, the precipitate (Fraction I), was rejected, and the filtrate and washings were concentrated to 300 cc. and poured into 3 liters of 93 per cent alcohol. After the precipitate had settled and the supernatant liquid had been decanted off, the precipitate was mixed with 300 gm. of cornstarch, macerated in absolute alcohol, filtered on a Buchner funnel, washed with absolute alcohol, and dried in an oven at from 50 to 60° C., making Fraction II. The washings and decanted extract were reduced to small volume by vacuum distillation, taken up on 100 gm. of cornstarch, and dried (Fraction III).

Fraction II, when used as the sole source of vitamin B, had no growth-promoting properties, but prevented pellagralike symptoms in rats. When combined with a small amount of the extract rich in vitamin F, growth was promoted. Fraction III was found to retain more of vitamin F than Fraction II and to have a more laxative action.

A further demonstration of the supplementing action of vitamin F for leaves, previously shown to be richer in G than in F, was given in experiments in which dried kudzu leaves were used as the source of vitamin B. On 0.15 gm. of the dried leaves as the sole source of vitamin B, the rats steadily declined and died of beriberi, while those on 0.1 gm. of the leaves and 0.05 gm. of the activated vitamin F solid made slight but consistent gains.

In discussing their experimental work, the authors advance the opinion that in the preparation of a vitamin G concentrate it is preferable to remove vitamin F as completely as possible by the method outlined before resorting to heat. This is on account of the possible deleterious effects of the presence of inactivated vitamin F in the final fraction when heat alone is used to remove vitamin F.

The absorption spectra of oils and oil constituents with special reference to pro-vitamin D, I. M. HEILBRON, E. D. KAMM, and R. A. MORTON (*Biochem. Jour.*, 21 (1927), No. 6, pp. 1279-1283, figs. 5).—The authors have attempted to determine whether or not ergosterol can be detected in vegetable oils by means of the spectroscope, since pure ergosterol shows absorption bands at 293.5 μ , 281.5 μ , and 270 μ .

It was found that the sensitivity of the method depends chiefly upon the transparency of the oil under investigation, and that a negative test does not exclude a concentration of ergosterol less than 0.2 per cent. The absorption band at 247 μ , considered by Morton, Heilbron, and Kamm (*E. S. R.*, 58, p. 794) to be characteristic of vitamin D (irradiated ergosterol), was found to be detectable only in concentrations of the vitamin of the order of 0.01 gm. per 100 cc. of alcohol, a concentration equivalent to some thousands of antirachitic doses of cod-liver oil. The absorption test is, therefore, quite unsatisfactory for detecting the presence or absence of vitamin D. Of the various materials tested spectroscopically, the sterols isolated from the unsaponifiable matter of cottonseed oil showed the presence of considerable amounts of ergosterol. Sesame, illipi nut, shea nut, pumpkin seed, and olive oils gave negative tests. Some samples of peanut oil showed no signs of selective absorption and others well-defined ergosterol bands. Yeast fat gave the most pronounced test for ergosterol of any of the fats examined. The samples of peanut oil showing

ergosterol bands also showed a more or less well-defined band in the neighborhood of 320μ , a band found hitherto only in oils of animal origin.

The chemical and physical characteristics of cod liver oil, A. D. HOLMES and W. Z. CLOUGH (*Oil and Fat Indus.*, 4 (1927), No. 12, pp. 403-409, fig. 1).—Data are reported on the physical and chemical constants of a total of 111 samples of cod-liver oils obtained from plants located along the Atlantic seacoast from New York to Labrador. The minimum and maximum figures reported were sp. gr. 0.92 and 0.927, refractive index 1.4772 and 1.482, saponification number 180.8 and 190.8, iodine number 147.5 and 183.1, free fatty acids 0.27 and 1.65 per cent, and unsaponifiable matter 0.97 and 1.4 per cent. It is of interest that only four samples exceeded a fatty acid content of 1.25 per cent, the majority of the samples having a content under 0.75 and about one-third less than 0.3 per cent, although a content of 1.41 per cent is allowed under the U. S. P. specifications for medicinal oils. In view of the variations in chemical and physical characteristics, as well as in vitamin potency, of different cod-liver oils, it is suggested that it should be kept in mind that cod-liver oil can not be considered as a chemically pure substance with uniform characteristics and vitamin content.

The effect of irradiation and cod liver oil on the calcium balance in the adult human, M. C. HART, D. TOURTELLOTTE, and F. W. HEYL (*Jour. Biol. Chem.*, 76 (1928), No. 1, pp. 143-148).—A series of metabolism experiments conducted on an adult human subject showed no increased tendency to calcium, phosphorus, or magnesium retention on an acid-forming calcium-deficient diet as the result of daily irradiation for a period of 20 days with a quartz mercury vapor lamp, nor was there increased retention when cod-liver oil was added to the diet in 12-cc. daily doses.

The effect of carbon arc irradiation on the health of a group of infants, L. H. BARENBERG and J. M. LEWIS (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 7, pp. 504-506).—A previous study of the effect of systematic irradiation from a mercury vapor lamp on the health of infants, particularly in respect to the occurrence of respiratory infections (*E. S. R.*, 56, p. 91), has been repeated with irradiations from a carbon arc lamp on account of the fact that the rays from this source approach more closely those of the sun.

As was the case in the first study, there was no diminution as compared with untreated controls in the incidence of respiratory infections during the three months in which the treatment was given. The growth in weight and in height of the irradiated infants was greater in the first six weeks and less in the second than was that of the controls, these results also coinciding with those of the previous study. The hemoglobin percentages of the irradiated group were maintained, while those of the nonirradiated decreased by about 12 per cent.

Prevention of colds by ultra-violet radiation (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 7, pp. 547, 548).—An editorial comment based on the foregoing report and other evidence of a conflicting nature, showing the need of further evidence before faith can be placed in the value of ultra-violet irradiations in the prevention of respiratory troubles.

Quantitative study of clinical ultraviolet sources, H. GOODMAN and W. T. ANDERSON, JR. (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 9, pp. 671-673).—By means of selective filters, the authors have determined the distribution of the emanations of a number of practical sources of light, including the quartz mercury arc and various carbon arc lamps. For the purpose of the study, radiations between 2,900 and 3,200 Ångström units were classed as the vital ultra-violet, those between 3,900 and 3,200 as the intravital, and those below 2,900 as the extravital ultra-violet. Both the vital and extravital zones are considered

to be of therapeutic value in various ways, particularly as regards the prevention and cure of rickets, but to differ from each other in that the former is much more active in causing sunburn and tan.

A table is given of the strength of the various sources of light tested in terms of intravital, vital, and extravital rays in ultra-violet units in ergs per second per square millimeter of area at 40 in. These results are thought to be of value in determining necessary dosage with different sources of light.

Note on the induced fluorescence of ergosterol, O. ROSENHEIM (*Biochem. Jour.*, 21 (1927), No. 6, p. 1335).—This is a brief note to the effect that the blue fluorescence frequently observed when ergosterol is exposed to ultra-violet rays screened from visible rays bears no relation to the formation of vitamin D, but is probably due to the formation of traces of oxidation products.

The pH of the contents of the gastrointestinal tract in dogs, in relation to diet and rickets, D. M. GRAYZEL and E. G. MILLER, JR. (*Jour. Biol. Chem.*, 76 (1928), No. 2, pp. 423-436).—This is the complete report of an investigation which has been noted from a preliminary report (E. S. R., 57, p. 788).

Nutritional anemia on whole milk diets and its correction with the ash of beef liver, J. WADDELL, C. A. ELVEHJEM, H. STEENBOCK, and E. B. HART (*Science*, 67 (1928), No. 1727, pp. 139, 140).—Supplementing previously-noted studies on the value of the ash of various materials in the cure of nutritional anemia in rats on a whole milk diet (E. S. R., 57, p. 194), the authors report that the ash of beef liver was effective when fed in amounts furnishing 0.5 mg. of iron daily, but that a ferric chloride solution fed at the same level of iron was without effect. The results are thought to confirm the previous conclusion that nutritional anemia induced by a whole milk diet is due to an inorganic deficiency.

Treatment of pernicious anemia by liver, H. F. BREWER, A. Q. WELLS, and F. R. FRASER (*Brit. Med. Jour.*, No. 3500 (1928), pp. 165-168, figs. 5).—This report of the results obtained, as measured by blood count, hemoglobin percentage, and general physical condition, in the treatment of 19 pernicious anemia patients with whole liver or liver extract confirms previous evidence as to the value of the treatment. In the authors' experience no serious difficulties have been encountered in administering the large amounts of liver required in the treatment. It is stated that most of the patients preferred the liver stewed, although fried liver and liver soup were acceptable variations. The raw juice mixed with orange juice has proved useful, particularly in the cases of the more seriously ill patients.

Results of the dietary treatment of pernicious anemia [trans. title], R. SEYDERHELM (*Klin. Wchnschr.*, 7 (1928), No. 1, pp. 1-5, figs. 2).—A review of the literature on the subject, with 29 references from American, English, and German sources.

The frequency of botulism.—Report of outbreaks for 1927 (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 10, p. 764).—This yearly report (E. S. R., 57, p. 95) lists five outbreaks of botulism reported in 1927 in the United States, one each in Colorado and Montana and three in California. All of the outbreaks, which involved 11 persons with 10 deaths, were caused by home-canned foods (corn, string beans, and pears) with visible signs of spoilage.

The frequency of botulism (*Jour. Amer. Med. Assoc.*, 90 (1928), No. 10, p. 770).—An editorial comment on the foregoing report, with special emphasis on the inadequacy of the heat processes frequently used in home canning.

Iodine deficiency in water as an index of goiter, D. F. SMILEY (*Amer. Jour. Hyg.*, 8 (1928), No. 2, pp. 297, 298).—Attempted correlation between the incidence of enlarged thyroid glands in freshman male students at Cornell Uni-

versity and the iodine content of the drinking water in the regions from which the students came showed that 67.6 per cent of 967 students with enlarged thyroid glands were from regions whose water supplies contained from 1 to 22 parts of iodine per hundred billion, while 57.3 per cent of an equal number of students with no thyroid enlargements were from regions having no higher content of iodine in the drinking water. It is suggested that "the iodine content of the water of a region is not an accurate index of the frequency with which thyroid enlargement is to be expected in college students who come from that region."

Iodine in the prophylaxis of goitre (*Lancet* [London], 1928, I, No. 7, pp. 345, 346).—A brief review of recent literature.

TEXTILES AND CLOTHING

Textile chemists and colorists association: Its technical and research program, L. A. OLNEY (*Textile World*, 73 (1928), No. 5, pp. 321, 323, 325).—This is a résumé of the activities of the American Association of Textile Chemists and Colorists since its organization.

Researches and studies of technical problems by associations, schools, and other organizations (*Textile World*, 73 (1928), No. 5, pp. 154, 155, 325, figs. 2).—This article indicates the scope of investigations with textiles carried on by trade associations, institutions, and governmental agencies.

Modern spectroscopy as applied to textile industries, S. J. LEWIS (*Jour. Soc. Dyers and Colourists*, 43 (1927), No. 12, pp. 391–393, pl. 1).—The general utility of spectrographic analysis in the examination of water, mordants, dressings, stains, tints, and dyestuffs.

Growing and marketing wool, P. A. ANDERSON (*Minn. Univ. Agr. Ext. Spec. Bul.* 117 (1928), pp. 14, figs. 7).—The practical information presented deals with selecting and feeding sheep for wool production, shearing and handling the fleece, and grading and marketing the wool.

The tensile testing of single wood fibres, P. KRAIS (*Jour. Textile Inst.*, 19 (1928), No. 1, pp. T32–T36, pls. 2, fig. 1).—The method and apparatus used by the Dresden Textile Research Institute for measuring the tensile strength, breaking extension, and torsional resistance of single fibers is outlined, and several applications are cited.

Theories of dyeing wool, A. P. SACHS (*Textile Amer.*, 49 (1928), No. 3, pp. 21–23, 59).—The several theories of dyeing are discussed briefly, and the colloidal theory is treated in some detail. Dye solutions appear to be colloidal in nature, and wool is an amorphous colloid and an amphoteric protein. The reaction between wool and dyestuffs probably resembles in general nature but differs greatly in detail from the reactions between other textile fibers and dyestuffs. The process of dyeing wool is held to be strictly a colloid-chemical phenomenon, involving adsorption of the dyestuff by the fiber, due to differences in electrical potential formation of a chemical compound (a salt of wool and dyestuff) which causes the dyeing to be fast and prevents the reversal of the adsorption process.

Cleanness defects in silk thread that interfere with operations and lower quality, W. P. SEEM (*Textile World*, 73 (1928), No. 6, pp. 27, 28, figs. 2).—Defects in silk thread are illustrated, with data on their frequencies.

Possible cellulose bases for rayon manufacture . . . , J. E. JACKSON (*Textile World*, 73 (1928), No. 8, pp. 21, 22, figs. 4).—The merits of various plant materials as sources of cellulose are indicated briefly.

The manufacture of artificial silk, with special reference to viscose, H. R. S. CLOTWORTHY (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 47 (1928), No. 2, pp. 24-30, figs. 8).—The several methods of making rayon are outlined, with detailed information on the viscose process and data on the dyeing, chemical, and physical properties of rayon.

MISCELLANEOUS

Report of Northwest Experiment Station, Crookston, 1926, C. G. SELVIG ET AL. (*Minnesota Sta., Crookston Substa. Rpt. 1926*, pp. 64, figs. 11).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of Northwest Experiment Station, Crookston, 1927, A. A. DOWELL (*Minnesota Sta., Crookston Substa. Rpt. 1927*, pp. 57).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-sixth Annual Report of the New York State Agricultural Experiment Station [1927], R. W. THATCHER (*New York State Sta. Rpt. 1927*, pp. 60).—This contains the organization list, a review of the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report [of the Vermont Station, 1927], J. L. HILLS (*Vermont Sta. Bul. 276 (1927)*, pp. 16).—This report contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and a report of the director on the work of the station.

NOTES

Maine Station.—Recent appointments include Gail M. Redfield as assistant in home economics research, beginning January 1, and Florence L. Markin as assistant in plant pathology research, beginning April 1.

Rutgers University and New Jersey Stations.—Arthur L. Pierstorff has resigned as extension specialist in fruit growing. John M. Cregar has been appointed creamery inspector.

New Mexico College and Station.—A new dairy building is under construction. It will contain offices, testing laboratories, a creamery laboratory, and a farm dairy laboratory, and will be equipped with modern apparatus for making butter, cheese, and ice cream and the production of market milk.

Experiments to substitute cottonseed meal for a part of the expensive meat scrap in poultry rations have indicated that the cottonseed meal is more economical, but that when fed in the mash in a proportion greater than from 10 to 15 per cent the quality of the egg is seriously impaired. The yolks appear spotted and at times are very dark in color, and unless some way can be found to overcome this condition it is believed that the availability of cottonseed meal for feeding laying hens will be very limited.

C. D. Bohannon, vice dean of the School of Agriculture, has resigned, effective September 1, to complete work for the Ph. D. degree in Columbia University.

Cornell University.—The State legislature has appropriated \$1,100,000 to finish the plant science building of the New York State College of Agriculture, for which the foundations were laid last year. This building is to house the departments of botany, plant pathology, genetics and plant breeding, pomology, and floriculture, with that of vegetable gardening adjacent.

North Dakota Station.—A branch laboratory of the State pure seed laboratory has been established at Park River in connection with the Walsh County Agricultural School. This laboratory will be in charge of H. D. Long, former field crop inspector in the station.

G. G. Gardner, assistant in farm management, has resigned.

Rhode Island Station.—E. S. Garner, a graduate in agriculture from Oxford University and the University of California, has been appointed agrostologist.

Virginia Truck Station.—The State legislature at its recent session granted an appropriation of \$30,000 for additions to the present laboratory and office building.

A field day was held at the station April 17, at which time a large number of farmers, seed dealers, and others examined the breeding plats on which the improved strains of Virginia Savoy spinach are being developed and the greenhouses in which wilt-resistant strains of tomatoes are under test.

Dr. F. W. Poos, entomologist, has resigned to accept a position with the Bureau of Entomology, U. S. Department of Agriculture. George E. Gould of the University of Kansas has been appointed assistant entomologist, effective May 1, vice H. S. Peters resigned to continue graduate work at the Ohio State University.

Washington College and Station.—Dr. Luther A. Black, assistant in dairy bacteriology in the University of Illinois, has been appointed instructor in bacteriology in the college and associate in dairy bacteriology in the station. Albert P. Larson has been appointed research fellow in plant breeding.

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